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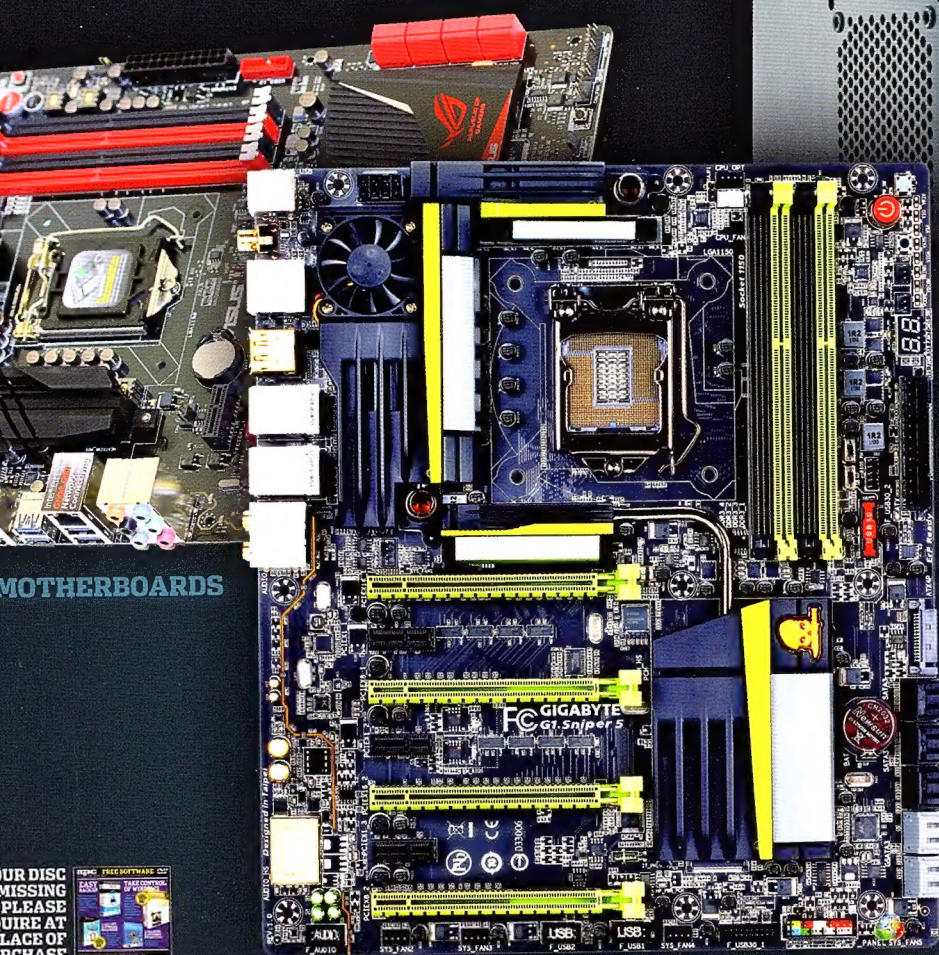
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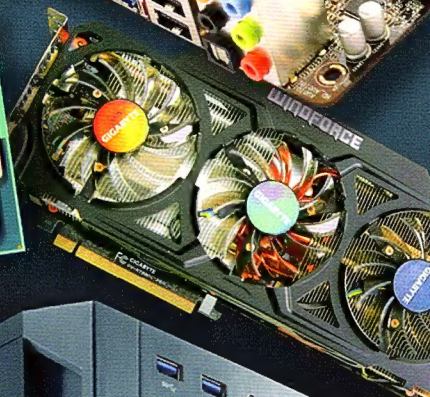
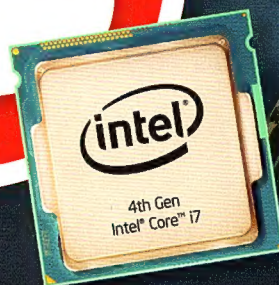
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Saying goodbye to an old friend



In retrospect, it's hard to believe I could build up such a strong emotional attachment to something like a web service. However, when Google announced back in March that it was closing Google Reader, its personalised news-reading web site, I was, it's fair to say, rather emotional.

Over the intervening months, I've trudged through the five stages of grief over Reader's impending demise, starting with denial ("No... they wouldn't, would they?"), anger ("How could they be so stupid!"), bargaining ("...maybe if I sign this petition..."), depression ("How will I get my news now?"), and acceptance ("Fine then. I guess Feedly isn't *that* bad...").

My attachment to Reader was initially a pragmatic one: it made my job easier, letting me check through loads of tech news each day in an incredibly efficient fashion – and critically, syncing my progress across multiple devices. Alongside Google Docs, it was an early example of the power and convenience that could be offered by the now almost-ubiquitous cloud computing.

More than that, though, Reader also reflected my own way of approaching the world – an attempt to strip back all the noise and to expose the raw gooey data at its core. It was like drinking spring water straight from a bubbling brook – and once you've tasted that kind of freshness, it's hard to go back to bottled. Reader wasn't pretty by conventional standards, but for us fans, there was still an undeniable beauty to its utilitarian design. That's something that's become relatively rare on today's web, though it can still be found reflected in other small pockets of it – Reddit is also a great example of solid content (well, some of it) triumphing over a flashy visual design.

If anything good has come out of Google Reader being taken out to pasture, it's that it's spurred something of a rediscovery for the standard that made Reader possible at all: RSS. In fact, more than half a dozen good alternative RSS readers have sprung up looking to fill the gap since the shutdown was announced and there are some genuinely varied and compelling options out there. We've demonstrated how to get up and running with one of those – the Old Reader – on page 84. It looks a lot like Google's original and even adds back in the sharing features that Google stripped out when it launched Google+.

As hinted above, I've somewhat settled on Feedly, as it syncs with some of my favourite third-party apps. But I know that I'll likely never have the same warm feelings for it as I did for Reader.

What technologies have you formed a special bond with that you've reluctantly had to say goodbye to?

Dan Gardiner

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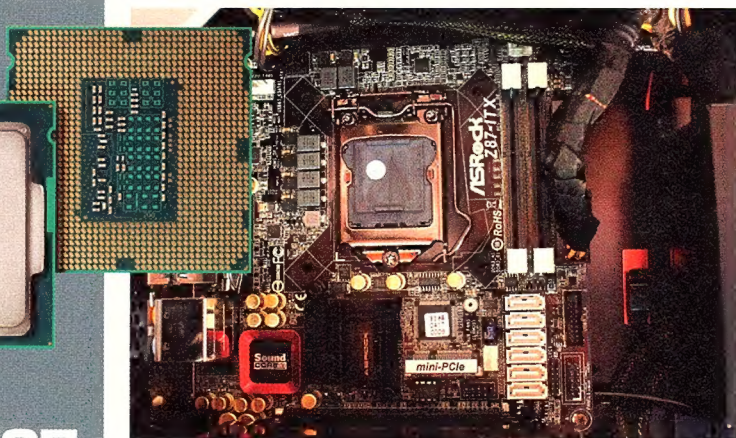
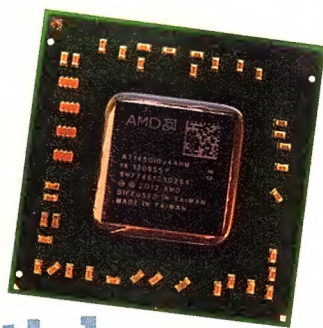
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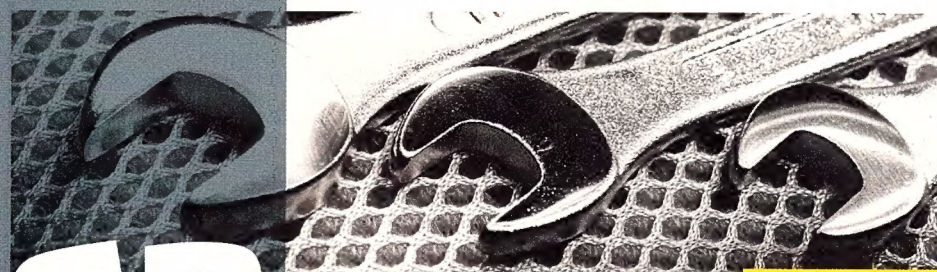
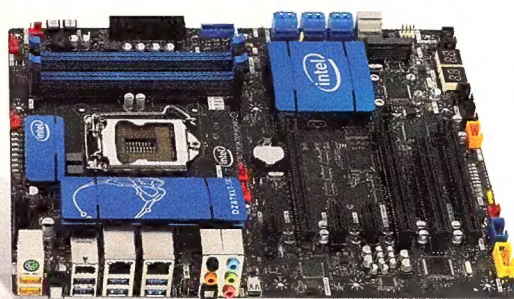
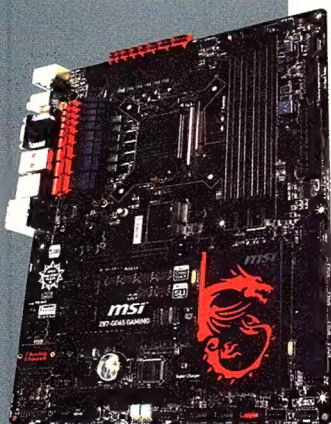
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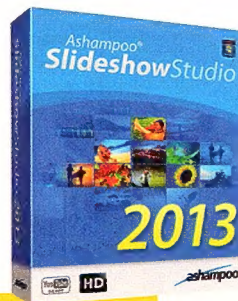
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SURVEILLANCE

THROUGH A PRISM DARKLY

Last month's NSA security revelations threw the issue of Big Brother-style technological surveillance firmly back into the spotlight. **Peter Dockrill** reports.



The PRISM scandal only hit the headlines last month, but it's already become the most damning and defining privacy controversy this century. Here's a look back at some of the most stunning developments of the digital surveillance saga as they happened.

1 THE PHONES ARE TAPPED

Before the PRISM scandal itself became clear, *The Guardian* broke news of a parallel surveillance operation: by top-secret court order, the US NSA (National Security Agency) was reportedly collecting phone records of millions of customers of American telco Verizon indiscriminately. While it was not alleged that calls were being listened in on, the call data of millions of US citizens was said to be logged (phone numbers, location data, time of call, duration of call, etc) in bulk, and without any suspicion or evidence of wrong-doing. Verizon declined to comment. A follow-up piece by *The Guardian* described the interceptions as "the broadest surveillance ruling ever issued."

2 DIRECT ACCESS

Right after *The Guardian's* article was published, *Washington Post* followed up with even deeper allegations. According to its report, the NSA and FBI (plus the UK's GCHQ) had access, via a top-secret program code-named 'PRISM', to tap directly into the servers of nine major US web companies – including Microsoft, Yahoo!, Google, Facebook and Apple, among others – for the purpose of monitoring email, chat records, photos, videos, file transfers, social networking data and more (and all without requiring a warrant). According to the report, PRISM's focus is not on monitoring US citizens but rather is set up to enable agencies to track 'foreign targets' outside the US.

3 CORPORATE DENIALS

In the face of public pressure and intense media attention, the technology corporations involved issued firm denials of the PRISM allegations, each rejecting the claim that they gave the US government direct access to their

servers (which subsequently prompted media speculation about what exact kinds of access they *did* in fact enable). Amid the ongoing controversy, several companies publicly appealed to the US government for permission to disclose details of federal data requests (to indicate the limited extent they cooperated with authorities). The disclosures in themselves make for interesting reading (see Apple's as an example at tinyurl.com/jwknvjg).

4 THE OBAMA POSITION

The tech companies alleged to be part of PRISM weren't the only ones denying (aspects of) the reports. The US Director of National Intelligence called the leaks "reckless disclosures of intelligence community measures used to keep Americans safe. In a rush to publish, media outlets have not given the full [lawful] context..." President Obama emphasised the systems were nothing new and were bipartisan programs authorised by the US Congress, but noted that he welcomed the debate, indicating it was "healthy for our democracy". He also said: "You can't have 100% security and [also] have 100% privacy, and zero inconvenience. You know, we're going to have to make some choices as a society."

5 PUBLIC ENEMY (OR HERO) NO. 1

A few days after *The Guardian's* first report, the chief whistleblower revealed himself: Edward Snowden, former technical contractor for both the NSA and CIA. Snowden claimed he leaked the classified information because he could not "in good conscience allow the US government to destroy privacy, internet freedom and basic liberties for people around the world with this massive surveillance machine they're secretly building." Despite not wanting to 'become the story', within hours he was the subject of viral 'internet hero' memes. After the leaks, Snowden fled Hong Kong (his temporary base) to Moscow with assistance from WikiLeaks. At the time of writing he is believed to still be located in Russia, despite intense US diplomatic and legal efforts to apprehend him for breaching security laws.

VODAFONE FINALLY JOINS THE 4G CLUB

Alex Kidman goes testing to find out how it stacks up.

After false starts and a couple of years in which Telstra's set up 4G sites across regional areas and Optus has committed to both FD-LTE and TD-LTE networks, Vodafone's finally actually entered the 4G market, albeit in a manner different to that of its competitors. Where both Telstra and Optus at first offered only modems and hotspots, Vodafone's focus has been on 4G-enabled handsets, with no announced modem plans at the time of writing.

Vodafone's launch is at first for established customers and tying that into the 'smartphones only' approach means that if you want in on Vodafone 4G, you've got to be running an LTE-capable handset such as the HTC One, Samsung Galaxy S4 or Apple iPhone 5. New customers have been taken on starting from July, but it's not yet clear if Vodafone will offer 4G for prepaid customers any time soon.

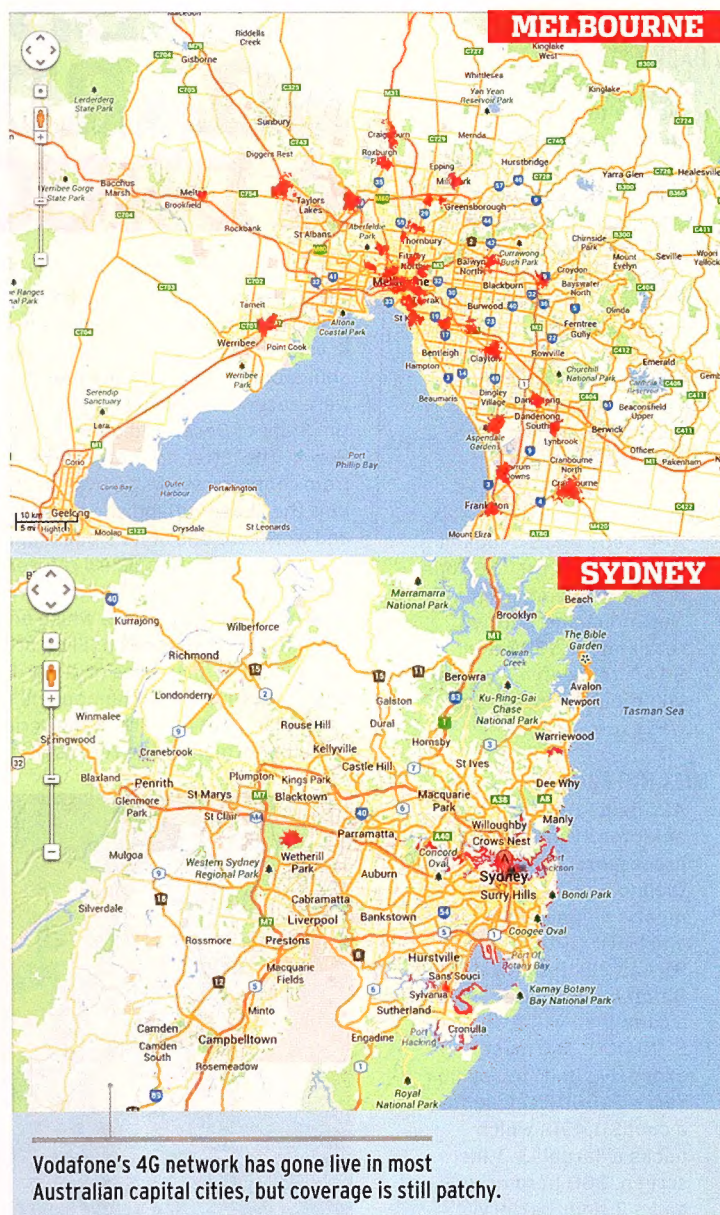
Vodafone's late to the game, but its claimed advantage lies in the fact that it holds licences for 20MHz of contiguous spectrum across its launch markets of Sydney, Melbourne, Brisbane, Perth, Adelaide, Newcastle and Wollongong. That gives it a leg up on its competitors in terms of both the theoretical speeds it can deliver – up to 100Mbps – and the customer base it can support with 4G speeds.

There's the problem, however, that Vodafone's network has suffered in recent years both from actual outages and a serious perception problem. With that in mind, we hit Sydney's streets to comparatively test Vodafone's 4G against that of Telstra and Optus, using a Sony Xperia Z and the Speedtest.net Android app to gather network data. Each test at each location was run three times and averaged, followed by as fast a SIM swap as was physically possible. We mixed between indoor and outdoor locations, as 1,800MHz networks have greater issues penetrating into building spaces (meaning any indoor test is, by its nature, a tougher test). Mobile networks are variable critters and, from our observations, Vodafone's 4G is no better or worse than its competitors in terms of finding 4G, at least in the areas where Vodafone's willing to say it's got coverage.

Vodafone's results were pleasing and notably faster in all but one test. Tie that into the fact that, like its competitors, it doesn't charge any extra for 4G data and that makes it potentially solid value – with a few catches.

Vodafone's big issue here is one of coverage; while its coverage maps are a little more granular than those of its competitors, it's still got a smaller overall 4G footprint than either Optus and especially Telstra. We hit this most notably in our test on the platform at Sydney's Town Hall station, where both Optus and Telstra could supply a 4G signal, but Vodafone simply couldn't. It took several minutes to find a signal at all and when it did, it was simply 3G. Further repeaters and extension of the network may solve that issue over time, but for now, Vodafone's 4G footprint isn't massive.

From a technical viewpoint, Vodafone's network is laudable, but it's worth pointing out that it would have been under significantly less pressure than that of its competitors at the time we tested it. (The network is brand new and Vodafone's only been selling 4G-capable handsets for a fairly short period of time.) We did test after the network



had launched to the public, so there would have been at least some 4G Vodafone devices out there, but it'll be interesting to see if Vodafone can keep these speeds up once the network is under more serious pressure.

THE (A)PC REVOLUTION AUGUST/1997



HACK ATTACK

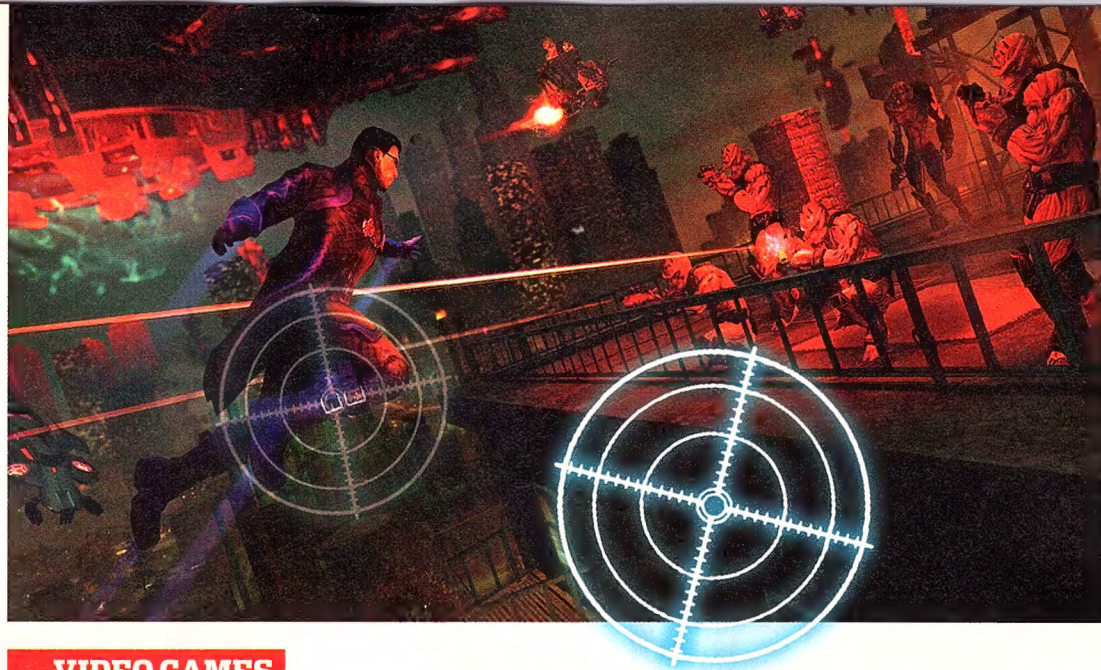
Oh, for the days when all we had to worry about were 'modem toting vigilantes' whose biggest crimes were defacing government web sites. This tell-all story on hackers features interviews with a handful (many still teenagers) and touches on early DDoS attacks, swiped credit card numbers and the US military's first cyber warfare exercises.

56K MODEMS

APC Labs takes a look at a couple of the first 56Kbps dial-up modems from NetComm and Courier, retailing for \$399 and \$449, respectively. (And you thought broadband was expensive!)

MMX NOTEBOOKS

APC tests its first batch of laptops running Intel processors with MMX technology. Each must meet a minimum spec of a 166MHz CPU, Windows 95 and 32MB of RAM; the 11 notebooks tested have a combined value of over \$100,000. The most expensive unit? A Toshiba Tecra 740CDT selling for a cool \$11,490, which packs a 'large' 13.3-inch screen, 3GB hard drive and a 2-hour battery life. It weighs in at a spritely 4.4kg.



VIDEO GAMES

CLASSIFICATION BOARD (STILL) HAS A DRUG PROBLEM

If you thought we'd left all the video game classification shenanigans behind us when the R18+ rating was finally introduced in January this year, it's time for a reality check. Despite the new adults-only category, two hotly anticipated games were recently refused classification – zombie survival sim *State of Decay* and open-world action game *Saints Row 4*. The latter has never been a series to shy away from controversy; it's so over the top, in fact, that for fans the sheer outlandishness of characters, story and world are one of its biggest appeals.

The Classification Board refused to classify *Saints Row 4* for two reasons: "Interactive, visual depictions of implied sexual violence which are not justified by context" and "elements of illicit or proscribed drug use related to incentives or rewards". Knowing *Saints Row*'s unique sense of humour, neither seems particularly out of place in the series and, having not seen the former, it'd be remiss of us to comment on it

– although it's said to centre around an 'alien probe' weapon being put someplace inappropriate.

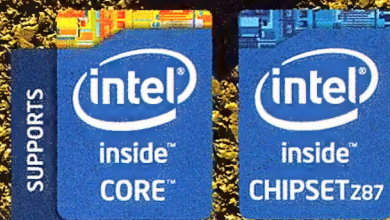
To ban a game for depictions of illicit drug use, on the other hand, seems a little heavy-handed to us, and it sounds like *State of Decay* was knocked back for that same reason. The game's executive producer recently posted on the community forums, stating that it was looking at options for resubmission, "including changing names of certain medications in the game to comply with ratings requirements".

Drug use is rife in other forms of media like movies, music and TV, so it begs the question: are depictions of interactive drug use in games (which often take place within a specific fictional context – like surviving a zombie apocalypse) so powerful and suggestive that Australian adults shouldn't be able experience them?

Across the pond in New Zealand, both titles have officially been given an R18 rating. **STC**



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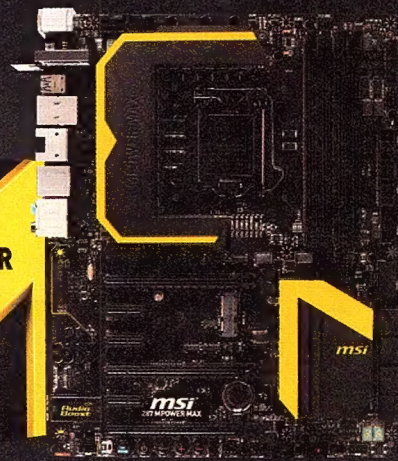


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10 gadgets

WearIT Smart Watch

This might well be the smart watch your doctor wants you to buy. Designed with sports and 'active lifestyle' use in mind, the WearIT runs Android 4.1, so unlike many other smart watches it doesn't need to be paired with a smartphone to work. In terms of hardware, it squeezes in GPS, Wi-Fi and Bluetooth plus a 1.54-inch touchscreen, 600MHz ARM CPU, 256GB of RAM and 4GB of storage. Via dedicated apps (which you'll be able to download via a special app store) you'll be able to display maps, monitor your heart rate and play music to Bluetooth headphones. (No word yet on whether it's actually able to tell time.) The WearIT is currently still just a prototype, but is expected to see retail release in the US around November. And yeah, that US\$399 price tag is perhaps a little bit ouch, but if it encourages us to get off our butts and into the great outdoors it has to be worth it... right?

ONLINE www.wearit.it

US
\$399



Tile

If you're the type that's constantly losing your keys, wallet, or perhaps even children, then this little tracking device should appeal to you. The Tile is a small key ring-sized plastic Bluetooth transmitter that can be tracked down (by a kind of echolocation) via an accompanying iOS app. The great news is that Tile never needs charging – although the downside to that is they'll only last a year before unceremoniously dying. The potential deal breaker for us is that there's no Android support – the developers cite the platform's lack of 'good' Bluetooth 4.0 support, but hope this will change in future. They're expected to ship around Christmas.

ONLINE www.thetileapp.com

US\$19
for a
limited
time



Logitech G510s Gaming Keyboard

The idea behind Logitech's new G510s gaming keyboard is to give players complete control over how the keyboard works. To the left of the standard keyboard keys are 18 programmable 'G' keys. Each of these can be programmed with three different macros, giving you a total of 54 different combinations. Macros could include selecting a particular weapon or spell in a game. Logitech's gaming software, which is a free download from Logitech's web site, allows you to customise the keys, as well as use specially made profiles for a number of popular games. You can also alter the colour scheme of the keyboard's LED backlight.

ONLINE www.logitech.com

\$160



Microsoft Sculpt Comfort Mouse

Microsoft has released a new batch of peripherals to complement Windows 8, including the new Sculpt Comfort Mouse. Like previous Microsoft peripherals, it's solidly made and looks decent, although we're not too sure about the big, blue Windows button on the side. Despite its rather brash appearance, the button is a handy addition; clicking it switches between an open app (or the desktop) and the Windows 8 'Start' screen, and swiping up or down on the button scrolls through your open apps. This mouse doesn't come with a USB dongle, instead connecting via Bluetooth. While this means you don't need to have a USB dongle sticking out of your sleek tablet or laptop to use it, if you're using a desktop PC then you may have a bit of trouble connecting it.

ONLINE www.microsoft.com/en-au



US\$40



**US
\$5,900**

Specialized Turbo

Believe it or not, it's apparently inconsiderate if you turn up to work all red-faced, dripping with sweat and stinking like a pair of recycled socks. That's the primary reason we stopped cycling to work. It's not *only* out of laziness that ebikes appeal to us then, but because we're concerned for the comfort of our fellow humans. And Specialized's new Turbo might be the best-looking ebike ever, primarily because it doesn't actually *look* like an ebike. Despite that slim frame, there's a 250W motor hidden in the back that's powered by a gigantic 342Wh battery. In the US, that motor will propel you up to 45km/h, although different Australian ebike regulations mean that if it does see a local release, that motor will have to cut out at 25km/h. I wonder how one goes about importing one of these...

ONLINE turbo.specialized.com

K-Array Anakonda KAN200

The KAN200 is ample proof that basically anything can be turned into a speaker these days. Yes, you heard right – this isn't some kind of funky bike lock, but a modular speaker system that's designed to be used where normal speakers can't. Each speaker unit is 2m long, dust and water resistant (up to IP55 specifications) and can be bent and twisted into different shapes to suit the install environment. We're keen to daisy chain a few together, hide them in the grass and play snake-hissing sounds through them at our next barbie... On second thought, we don't think IP55 is rated to withstand axe/shovel impacts.

ONLINE www.k-array.com.au



**US
\$899**



TAIPEI'S MOST INFLUENTIAL

The annual Computex show is a great place to get a taste of what's hot — and what's not — in cutting-edge tech. **Bennett Ring** uncovers the trendsetters of 2013.

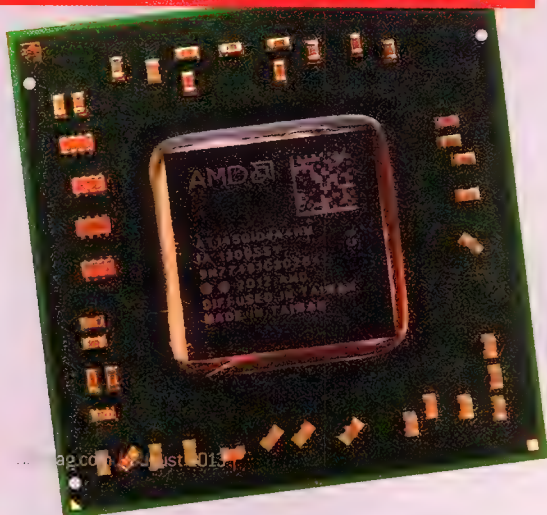
01 DIGITAL POWER SUPPLIES

Digital power supplies have been available in the server market for many years, but their astronomical price has made these ultra-efficient power bricks well out of reach of the average PC owner. Computex 2012 saw the very first consumer-level digital PSU in the form of Corsair's AX1200i and it's taken a year for the other power companies to catch up, with a plethora of digital PSUs on show at this year's Computex. Most of the major brands had prototypes on display, but this trend wasn't limited to the big boys, with numerous lesser-known Asian manufacturers demonstrating their take on the tech, including Compuware and Super Flower.

We had a lengthy demonstration of digital PSUs at both the Antec and Cooler Master booths, where the benefits of each implementation were explained. One benefit shared by all digital PSUs is their ability to monitor and display important power information within Windows-based software. This can show how efficient the PSU is at any time, what wattage it's drawing and which rails are being used. They can even cause the PC to shut down if dangerous surges are detected. Antec spent 20 minutes pointing out that Corsair's monitoring software still isn't working properly a year after launch, so it appears the technology is still new enough to come with a few bugs. Digital is also — on average — more efficient than analogue PSUs, so expect these to become the new standard, despite the rough edges with the software.



02 AMD's RICHLAND & KAVERI



Intel might have scored the lion's share of the publicity, but that didn't stop AMD from trying. The biggest push was behind the company's new Elite A-series of APUs, formerly codenamed Richland. While its core-for-core performance against Intel's latest and greatest isn't exceptional, AMD reminded attendees that when it comes to integrated graphics performance, AMD is the company to beat (Richland has a 20% lead over Intel in this area). However, Intel is catching up with each new product release and at this rate, Intel will possibly overtake AMD's APU graphics performance in a couple of years, which is why AMD also demonstrated its upcoming Kaveri architecture.

The CPU side of this in-development APU is based on AMD's Steamroller design, while the GPU side will utilise the Graphics Core Next architecture at the heart of the company's popular Radeon HD 7000 series. Built on a 28-nanometre process, AMD claims Kaveri will improve CPU performance by an impressive 15% to 20% — well in excess of Haswell's meagre 12% CPU performance increase over Ivy Bridge.

Finally, AMD also showed off Temash, its new ultra-low-power solution for two-in-one tablet/laptop hybrids. This quad-core CPU uses less than 10W of power, while the dual-core version halves this to an impressive 5W.

03 MULTIPLE MONITORS



When the integrated graphics processor in Intel's latest fourth-generation Core CPU can easily power three separate monitors, it's obvious that the market is heading towards two or three screens as the new standard. Many of the PCs on display at the show were connected to multiple monitors and AMD once again used the opportunity to highlight its Eyefinity display technology. While this has traditionally been the superior way to double or triple your screen size, Nvidia has made huge progress in its multiple monitor support and we noticed many of the triple-display setups were running off Nvidia's new GeForce GTX 780 graphics card. This ships with a single HDMI output, twin DVI outputs and a single DisplayPort. Speaking of which, most of the more expensive monitors at the show included a single DisplayPort input that's capable of running the new 4K standard at 60Hz. ASUS demonstrated one such monitor, the PQ321, a 31.5-inch behemoth comprising a retina-pleasing 3,840 x 2,160 pixels.



04 WINDOWS RT IS DEAD

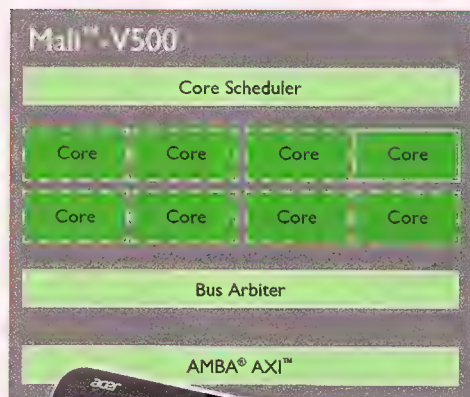
At last year's Computex, we couldn't round a corner without bumping into a tablet running Windows RT. This year, we couldn't find a Windows RT device no matter how hard we tried. It was truly strange to see such an important product at last year's show utterly vanish a mere 12 months later. The lack of Windows RT devices speaks volumes about users' desire for a custom ARM-powered version of Windows that can't actually run Windows software, a problem that was so obvious we're surprised Microsoft didn't see it coming a mile away. While the tablet market continues to explode, RT does not, with a pathetically small 0.4% market share as of April. The total lack of any RT devices at Computex suggests that this offshoot of Windows has been quietly led out to the back paddock and put out of its misery.

05 MOBILE ACCESSORIES

Computex might be all about PC hardware, but manufacturers aren't stupid – they know the money is flooding towards the mobile market, with sales of tablets and smartphones experiencing record growth that the PC could only dream of. Unfortunately, many of these PC manufacturers simply don't have anything to offer the newly nomadic tech user and instead were demonstrating products that simply seemed pointless. As well as numerous phone cases and screen protectors, we saw other gadgets such as portable speakers that doubled as water fountains and phone stands that look like miniature artists' easels. At times it felt as if we'd stumbled into our local weekend markets, with stall after stall packed with identical plastic phone gimmicks. Hopefully we'll see fewer of them in future years, as these companies slowly die off.



06 ARM PROCESSORS



These days Intel's major competitors are the many companies building ARM processors. These energy-sipping chips are found at the heart of most smartphones and tablets, and ARM licenses its technology out to myriad chip builders. With 2.6 billion ARM processors shipped in the last quarter alone, serious amounts of money are being made on the flood of ARM-powered silicon. At this year's Computex, ARM unveiled several new designs. Chief among these was the Cortex-A12, a chip designed for the mid-range smartphone market that ARM believes is set to explode. ARM also has a new graphics chip in the works, the Mali-T622, although the most interesting product unveiled was the new Mali-V500. Designed primarily to encode and decode 1080p video, it's unique in that it promises hardware piracy protection. Intel obviously isn't going to stand idly by and watch the world move to ARM processors without putting up a fight, so it chose to promote the Atom processor as a low-power solution for mobile devices. Several devices based on this processor were unveiled, including the Acer Ionia W3 (left) and Samsung Galaxy Tab 3. ARM returned fire with performance metrics indicating that the latest ARM processors leave Atom for dead.

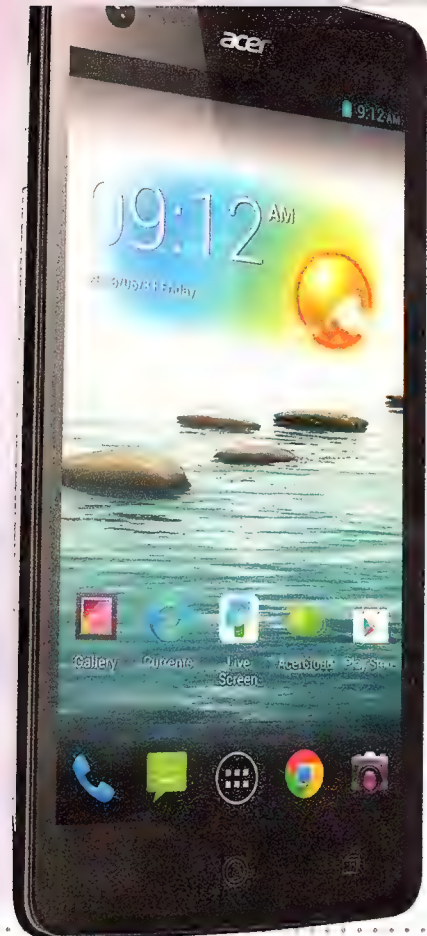
07 MINI-ITX

Welcome to the year 2002, when a daring new form factor promised to revolutionise the size of our computers. Mini-ITX measured just 17 x 17cm and was first launched by VIA Technologies. At the time, the technology was very expensive and underpowered, so it was relegated to the niche market of industrial and display computing.

Fast-forward to 2013 and it appears that mini-ITX is now ready for the masses and it's largely thanks to the fourth-generation Core i chips from Intel. This CPU continues the trend of moving components off the motherboard and into the CPU, which means board builders can shrink their PC backbones to even smaller dimensions. The result was an abundance of mini-ITX motherboards, computers and cases at the show, with every major manufacturer dipping its toe into the miniature pool. Gigabyte, ASUS, MSI and EVGA all had working mini-ITX motherboards, while the range of mini-ITX cases was simply too great to list.

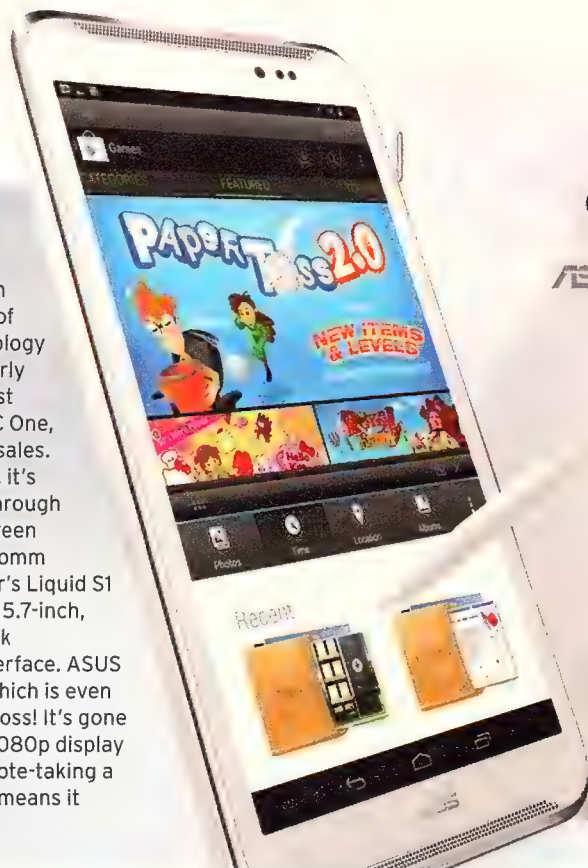
We've covered the mini-ITX gaming devices in our separate Computex gaming article (see page 54), but the form factor is intended to go well beyond that market. One of the most obvious uses is in home theatre PCs, where the slight dimensions make it suitable for cases no larger than your average DVD player. One of the more interesting applications is in all-in-one PCs, which can easily accommodate the tiny board and processor into their back panel. Gigabyte had the GB-AF21TS 21-inch all-in-one on display, with a removable mini-ITX motherboard nestled inside. This simply slides out come upgrade time, allowing the owner to swap out the memory or CPU with ease. No longer will all-in-ones be stuck frozen in time, limited to the same hardware they included the day they were purchased.





08 SMARTPHONES

Following on from the theme of ARM processors were the hundreds of devices powered by them, in the form of endless smartphones. These are one of the hottest items in the world of consumer technology right now, with explosive growth outstripping nearly every other category. HTC took out the prized Best Smartphone Award with the already released HTC One, a phone rumoured to make up half of HTC's total sales. Borrowing heavily from the iPhone 5's aesthetics, it's the powerful hardware inside that blazed a trail through its competitors, with an UltraPixel camera, HD screen and stereo speakers, all driven by a speedy Qualcomm Snapdragon processor and Adreno 320 GPU. Acer's Liquid S1 (left) also turned plenty of heads with its massive 5.7-inch, 720p display. Acer has stuck with a relatively stock implementation of the Android Jelly Bean 4.2 interface. ASUS showed off its new FonePad Note FHD 6 (right), which is even more of a pocket filler at a whopping 6-inches across! It's gone the whole hog with this one, using a razor-sharp 1080p display to fill the screen, and the included stylus makes note-taking a breeze. It's almost too big, but the very thin case means it takes up less space than you'd expect.

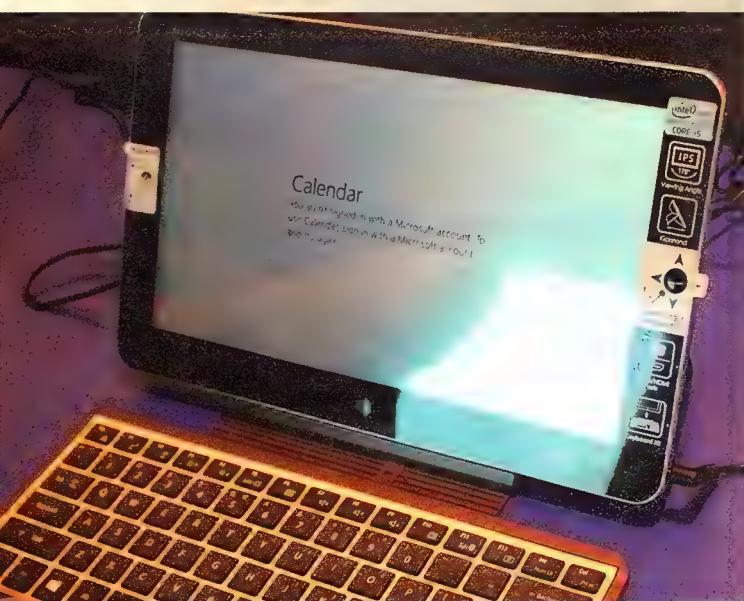


ASUS

09 TWO-IN-ONE TABLET HYBRIDS

Forget 'transforming' tablets, the new phrase for these devices is two-in-ones. We're not sure why the name changed, but it has, so deal with it! Easily the weirdest two-in-one of the show was actually a three-in-one, the ASUS Transformer Book Trio. It's powered by dual CPUs – a fourth-gen Core i7-4500U and Atom Z2580. You're probably wondering why it needs both. Well, ASUS has installed two operating systems on the Trio, with Windows 8 making the most of the Core i7, while Android Jelly Bean runs on the Z2580. It's a truly bizarre proposition, with instant swapping between each OS possible. Detach the keyboard and the tablet is an Android device; plug it back in and it flips back to Windows 8. Weird indeed.

Acer's Iconia W3 offers a remarkably compact full-blown Windows 8 experience, packing the full functionality of Microsoft's latest OS into a tiny 8.1-inch tablet. Shipping with the full version of Office included, the optional full-sized keyboard will be a must to make the most of it. Gigabyte unveiled the new U21M, with a rotating 11.6-inch screen that swivels to cover the keyboard, reminding us of the very first slate devices that Microsoft demoed so many years ago. Sony turned up the sexy with the VAIO Pro 11 and 13, which the Japanese company claims are the lightest products available in their respective sizes of 11.6 and 13.3-inches. They use a unique screen mount to convert between tablet and laptop mode.



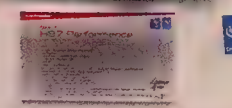
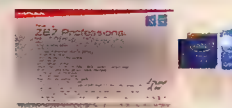
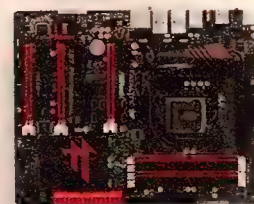
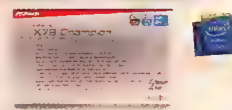
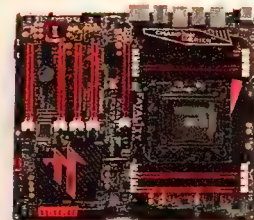
10 HASWELL

While Haswell's mediocre speed increase on the desktop has been a disappointment for power users, it seems the mobile market just can't get enough of Intel's new battery-saver. Intel used the event as the official public unveiling of the fourth-generation Core processor and it was easily the dominant technology of the show. Literally hundreds, if not thousands, of new products based around Haswell were on display.

Key to its popularity is the promise of incredible battery life and low heat, making this the perfect powerhouse for today's laptops. Intel's own numbers claim a 50% battery increase over the prior generation while playing HD video (up from 6 hours to 9), while standby time has increased by a factor of almost three, up from 4.5 days to a maximum of 13. It's no wonder nearly every laptop on display at the show was powered by Haswell, with AMD relegated to the occasional oddity. There's also the fact that Haswell's integrated graphics performance has been given a massive shot in the arm, delivering nearly playable performance in a wider range of games.

Not only did Haswell dominate the laptop scene, but its reliance upon the new Series 8 chipset meant that motherboard manufacturers used the show to introduce their product stacks based on the new chipset. We were presented with dozens of new Series 8 motherboards and again, AMD were limited to a couple of boards that nobody seemed to want to talk about. **APC**

Fatal1ty





PRISM: A THREAT TO CLOUD APPEAL

An *APC* reader isn't so sure about putting his life in the cloud anymore.

With the recent big revelations about PRISM and the US National Security Agency's surveillance of seemingly everything we do online, I find it quite insulting that the US government's only real response has been to assure Americans that *they* are not being intrusively spied on. That's nice, but what about the rest of the world? Isn't Australia supposed to be one of the US's closest allies in the war on terror? Is this how allies should be treated? America will not win the battle for hearts and minds if it does not change its attitude to individual rights – even if those individuals are not US citizens.

For me at least, this kind of all-encompassing surveillance also brings the appeal of cloud computing into doubt. If we can't trust the providers of cloud platforms – which are largely US-based companies – to keep our data and interactions safe from their government's prying eyes, then why should we trust them with handling much of our personal and business lives?

The cloud is undoubtedly a fantastic opportunity for businesses; it could truly revolutionise the way we work and it does offer far more convenience, especially if you frequently work away from the office. But if using cloud platforms means the end of privacy for myself and my business, this is one revolution you can count me out of.

Shaun Kingsley

SOLID STATE OF BLISS

I'd like to thank you for the comprehensive SSD coverage you provided in your July issue – it gave me the push I needed to install an SSD in my better half's ageing laptop, which has completely revitalised it. This is a machine that's been plagued by slowdowns and delays after years of software build-up. Even a complete factory reset didn't ultimately help much – by the time it had downloaded three years worth of Windows updates and I'd reinstalled all the core programs, it was running like a complete dog again.

I was reluctant to cave in and buy a completely new laptop as most now come with Windows 8, which my wife is not particularly keen on. Picking up a 240GB SSD with a USB transfer cable cost me a couple of hundred dollars (and transferring that old hard drive via USB 2.0 did take quite a few hours), but that's much cheaper than forking out for a new basic \$600 laptop – and there's no way the latter would come with an SSD either. Even on older laptop hardware, I'm amazed by what a difference it has made.

Bill Graham



POWER SAVINGS MATTER

I was fascinated to read of the power savings offered by new Haswell desktop systems in your July issue (page 6). After reading that you measured just 28.9W, I went out and bought a \$30 power meter to check what my current 2-year-old Intel Core i5-2500 machine draws, and was shocked to find it idling at around 110W! I am now sorely tempted to upgrade to the equivalent model (I'm eyeing off a new Core i5-4670 build and finally making the jump to an SSD) purely for the power savings alone. I run a home office, so my system is often switched on for upwards of 18 hours a day. And I'm not a huge gamer, so sticking to Intel graphics would suit me fine. I would love to see if you have any recommendations for power-efficient monitors to buy, too.

Zeljko Czesin

EPINIONS@BAUER-MEDIA.COM.AU

Come on, have your say!

We want to hear what you think. Add to these discussions or email your views (in fewer than 250 words) to epinions@bauer-media.com.au. All correspondence becomes the property of APC and is subject to editing. Letters must include full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.



MICROSOFT DOES AN XBOX ONE-EIGHTY

After an outcry over contentious features in its upcoming games console, the tech giant has been forced to do a massive about-face.

Microsoft must have realised that it had a hard sell on its hands when it announced the Xbox One's more radical new features. On paper, at least, they sounded great: 'play games without discs (even when visiting friends)', 'share games with up to 10 family members' and the ability to re-download games you'd purchased from Xbox Live, even if you'd bought them as physical copies.

But when the associated digital rights management (DRM) tech required to make those features viable was revealed – each purchased game would be tied to an individual user account, consoles would require daily online check-ins, games would be region-locked and the used-game trade-in policy was muddy as hell – the public backlash was loud and clear. What Microsoft probably wasn't expecting, however, was for rival Sony to listen to that uproar and promptly go in the complete opposite direction on every one of those issues with its own PlayStation 4 (PS4).

With the Xbox already selling at a price premium over the PS4 (the consoles will cost \$599 and \$549 in Australia, respectively), gamers voted with their wallets. According to some reports, preorders for the PS4 outpaced the Xbox One by up to 50% after this year's E3 games expo concluded. Sony was even cheeky enough to flaunt the fact, announcing that it was 'raising internal sales projections' for the console and also warning that demand might outstrip supply come the PS4's launch later this year. (Sony has since cited the response to the Xbox One reveal as being a 'very useful source' in planning its marketing.)

Proving the old adage that nothing can change a company's policies

faster than the sound of cash registers ringing to their competitors products, Microsoft did the only sensible thing: set itself on a complete reverse course, ditching the once-a-day check-in requirement, region coding and all the rest.

And Microsoft's about-face does ultimately seem to have paid off: the Xbox One had inched ahead of the PS4 for preorders, according to Amazon's sales chart rankings at the end of June.

That whole debacle does offer some food for thought for PC gamers, who've long put up with the same kind of DRM system that the Xbox One was originally scheduled to employ. For example, it's common practice for games to be tied to a specific user's account and be totally non-transferrable. Perhaps the difference here is that the PC scene has never really developed a strong second-hand market. PC owners also – by and large – pay lower prices for games than their console cousins. Despite those concessions, it's still worth asking: Are PC gamers getting exploited and have they just become resigned to the fact? And, perhaps more critically, is there anything they can now do to change it?

It's clear from all of this that big companies don't always have the best interests of the consumer at heart, but sometimes consumer uproar and market forces can actually combine to (as the old Australian saying goes) 'keep the bastards honest'.

It's just a shame that there's not a second big player in the PC operating system arena. If there were, perhaps we'd have seen the return of the classic 'Start' menu in Windows 8 by now.

ENDUSER

Share the hilarity!

Do you work in the IT industry and are forced to deal with inept and clueless end users on a daily basis? Do you have an IT professional, who isn't that 'professional'? If you have an interesting or amusing story, email us at apcmag@bauer-media.com.au. All correspondence becomes the property of APC and is subject to editing. Letters must include writer's full name, street address, suburb, state and phone number to be considered for print publication. Address and phone details will not be published.

WIRELESS MUSIC PLAYER

INSIDE THE SONOS PLAY:3

We take a look inside this all-in-one wireless music player.

BACKGROUND

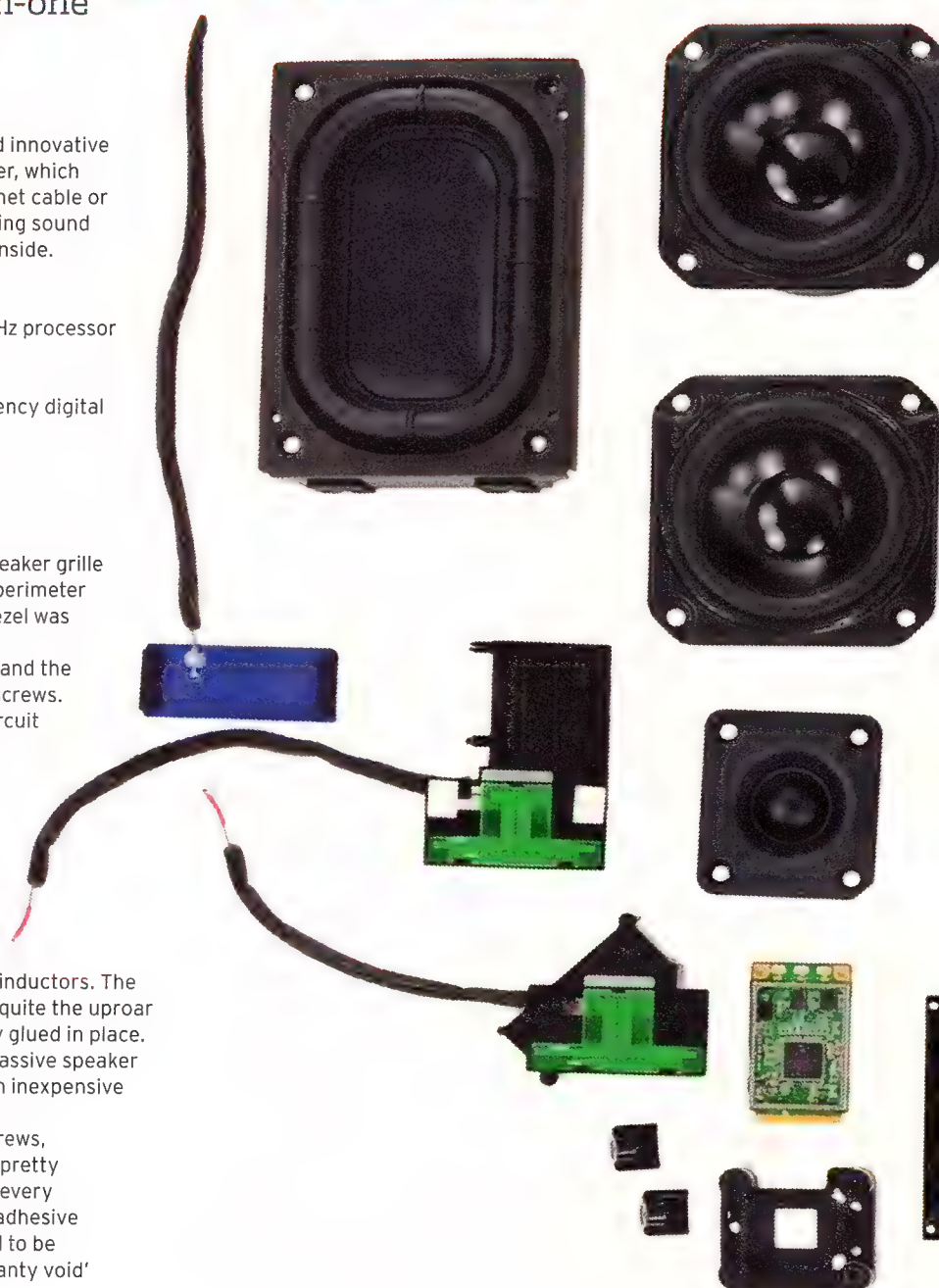
The popularity of digital music content demands new and innovative ways of listening to our music. This small portable speaker, which connects to your wireless router with the included Ethernet cable or wirelessly with the Sonos Bridge, lets you enjoy room-filling sound from the internet, your computer or NAS. Here's what's inside.

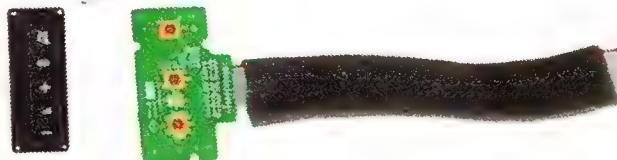
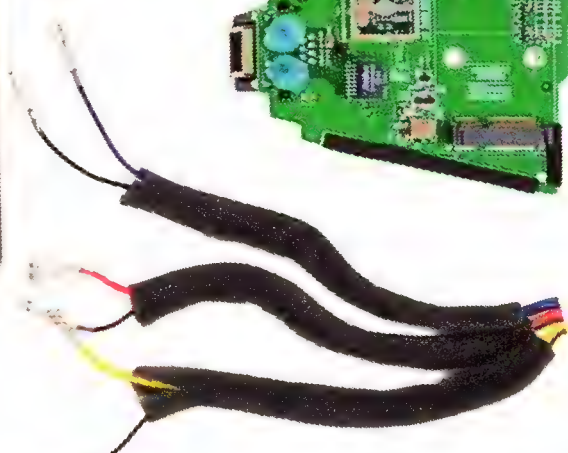
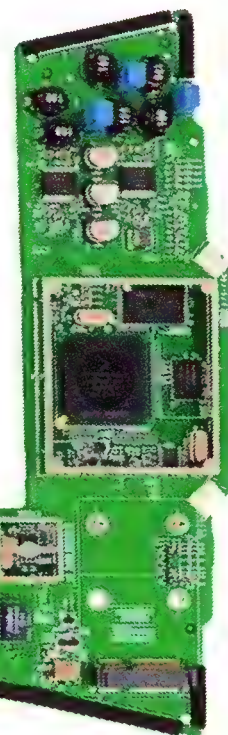
MAJOR TECH SPECS

- MPC8314VRADDA low-power PowerQUICC II pro 266MHz processor
- STMicroelectronics NAND 512W3A2SN6
- Nanya NT5TU32M16DG-3C 512MB DDR2 RAM
- STMicroelectronics STA339BW 2.1-channel high-efficiency digital audio system
- Ethernet port
- AC 120/240V power supply port

KEY FINDINGS

- A flick of our spudger allowed us to remove the front speaker grille with relative ease, although the gooey adhesive on the perimeter clips was reluctant to let go. 10 screws later, the front bezel was on its way out.
- How difficult is it to replace the two mid-range drivers and the one tweeter? Not very. Each is held in by four Phillips screws.
- Inside the Sonos Play:3 is a playground of wires and circuit boards, arranged methodically for space efficiency.
- Getting to the Play:3's motherboard was no Herculean task, even though it did require defeating the Hydra cables, as well as some Phillips screws. We found three antennas in the Sonos Play:3, all attached to a communications card on the motherboard and held in place with soft glue.
- Proceeding with caution, we carefully removed the 'AC 120/240V, 50-60Hz, auto-switchable' power supply board, populated by an array of capacitors and inductors. The smallest rattle or vibration inside the Play:3 will cause quite the uproar (and probably a product return), so everything is firmly glued in place.
- At long last, we found the advertised bass radiator, a passive speaker cone secured in the very back of the case that forms an inexpensive alternative to a powered subwoofer.
- All major components are held in place with Phillips screws, many of them the same size. The entire disassembly is pretty straightforward – a modular design means that nearly every component can be replaced individually. The glue and adhesive aren't impossible to overcome, but they definitely need to be reapplied to dampen vibrations. And of course, a 'warranty void' sticker stands between you and any repairs. **SDC**





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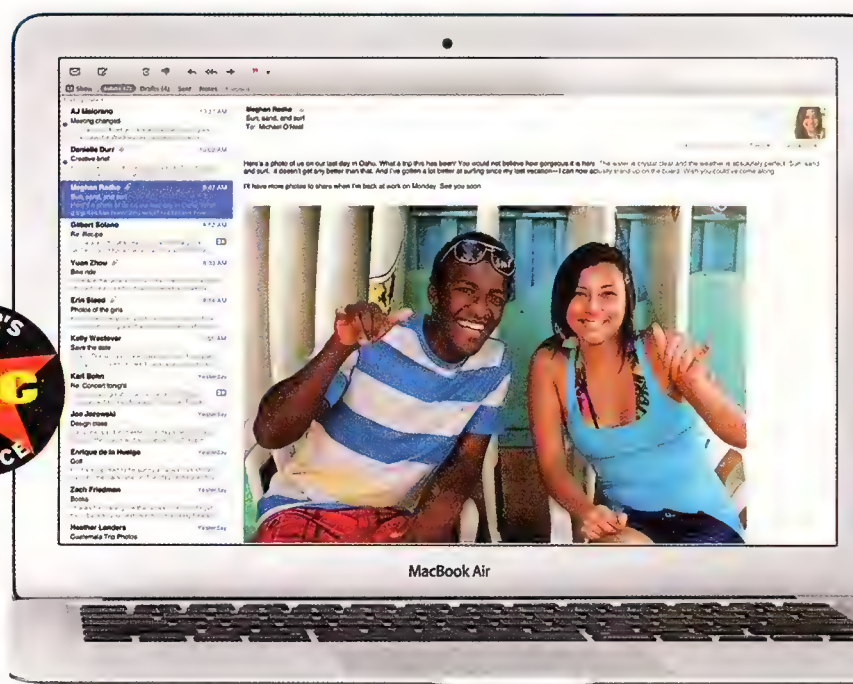
HASWELL ON-

Dan Gardiner puts three new laptops based on Intel's Haswell to the test. Are they really good for all-day use?

As we've mentioned in our more broad coverage of Intel's new chip, Haswell is really all about mobility; the big changes are ones that will have the largest impact on tablets and laptops. This month, we managed to scrape together three examples of the latter that largely reflect the different options available at launch; the sleek MacBook Air ultrabook, midrange HP Envy 15 TS all-rounder and gaming behemoth MSI GE70. So, how do these Haswell laptops stack up? Let's take a look at Apple's refreshed Air first.

9/10 Apple MacBook Air 13-inch (2013)

All day indeed.



www.apple.com/au

From \$1,249
(\$2,099 as tested)

Fantastic battery life,
excellent build quality,
lower pricing.

Not much in the way of
extra performance.

Apple's MacBook Air is the original ultrabook design that's now given rise to a sea of imitators – but even in that deluge it has managed to stand up as the one to beat.

And the designers at Apple are clearly happy to largely leave that winning formula alone: physically, there's nothing really new to see here – this is the same unibody aluminium chassis design as we've seen the last three years over, save for a few port changes, most notably the additions of Thunderbolt and USB 3.0 in 2012. In terms of performance, this Haswell Core i7 model only adds around 10%, at most, over that 2012 Ivy Bridge counterpart.

It's really all about power consumption and battery life, then. Apple claims a life of up to 12 hours on the new 13-inch Air, although that figure's likely to come from the lower-spec'd Core i5 units. We tested the highest-spec'd Core i7 version (combined with 8GB of memory and a 512GB SSD), so its power consumption will be the most demanding you'll see.

We tested the Air's battery using PCMark 8 on a Windows 8 BootCamp install. PCMark 8 is great for testing batteries, as it offers distinct workloads, with each stressing the system to different degrees. 'Home', for example, is the most demanding, offering a mix of web surfing, gaming, video playback and productivity tasks, while 'Work' is the least strenuous – much less multimedia, more office apps. Those two tests give markedly different battery life results – but, in summary, you can expect the Core i7 Air to last anywhere between 4:22hr to 7:09hr at 50% screen brightness.

Mac OS X doesn't have anything similar to PCMark for

battery testing, but we performed a video-playback battery test and got a similar result to the 'Work' run – 7:51hr. (When we tested a 2012 Core i5 model it only managed 5:44hr.)

More subjectively, we also clocked up rough battery life results of 7-8 hours in everyday use under OS X, so adding another 1-2 hours by dropping the brightness down isn't a huge stretch. (Though doing so will come at the cost of your eye comfort – a price we'd honestly rather avoid paying.)

Under the right circumstances then, the Air can go for an 8-hour working day. Some of that does come from the huge 7,300mAh battery (which takes up a good two-thirds of the chassis' interior), but the new Haswell ultra-low voltage chip inside certainly plays a role, too. Even just comparing the 2012 and 2013 Core i7 models based on how much juice they pull from a power point tells the same story: the 2013 chews about 6W idling, while the 2012 pulls double that at 12W.

Despite that long battery life, there's surprisingly little difference in the capabilities of this Core i7 ultra-low voltage chip and the more full-featured, faster-clocked ones found in the MSI and HP units. When it comes to overall performance, if you push the Air hard it can deliver, as evidenced by those competitive PCMark 8 scores. Of course, the price of going hard is that you'll 'only' get 4 and a half hours of battery life.

Given that most Ivy Bridge ultrabooks we've tested struggle to get to 5 hours, an extra 2-3 hours in a single generation is a great leap forward. True, there's not a lot of extra performance to go with it, but if it means we can avoid going back into the office a bit longer, we reckon it's enough.

THE-GO

7
10

HP Envy TouchSmart 15-j021TX

My kingdom for an SSD...



www.hp.com/au @

\$1,299 \$

Good specs and features at a keen price. ✓

No SSD, can be sluggish at times. ✗

HP's touchscreen-equipped Envy 15 is the middle layer in this month's Haswell sandwich, aiming to offer a pleasing mix of features and performance with reasonable portability, too. It's well-spec'd, with a Core i7-4700MQ CPU (running at 2.4GHz) alongside 8GB of memory, a 1TB hard drive and the 64-bit version of Windows 8. It's also good for a little bit of gaming, thanks to an Nvidia GeForce GT 740M.

Physically, the Envy takes the middle road, too, with a mix of plastic and metal construction materials. The palm rest area surrounding the keyboard is aluminium and there's a magnesium-alloy frame under the hood that keeps the whole thing feeling quite rigid. There are, however, still quite a few elements of the Envy 15's exterior shell that are plastic – the lid behind the screen and underside, for example.

And, as we mentioned earlier, the Envy is very well outfitted when it comes to features. It includes a huge trackpad and a solidly-built, almost MacBook-quality chiclet keyboard (which even includes a full numpad), along with four USB 3.0 ports, a fingerprint reader, HDMI video out, Gigabit Ethernet and an SD card reader. Plus, there's a unified 3.5mm headset in/out socket and a Beats audio system with four speakers (two of which are down-firing subwoofers). Those Beats speakers do manage to carry a decent bit of bass, too; they're above par for laptop speakers, but likely won't be replacing your stereo (or even a decent Bluetooth wireless speaker) anytime soon.

It is worth pointing out the one conspicuous absence from that feature list: there's no optical disc drive, so if you're they

type that's still dependent on optical media, you may want to give this one a miss.

Also missing is any form of SSD. And ultimately, that's perhaps the Envy 15's biggest let down. The 1TB traditional hard drive (running at a lowly 5,400rpm) inside can sometimes slow things down – once you've used an SSD, you do notice when it's not there. That's not just a problem with running disk-intensive tasks (like copying large files or installing applications) either, but affects general system responsiveness. For example, even basic tasks like searching for a specific app in the new 'Start' screen can sometimes unexpectedly pause for 10 or more seconds.

While we're laying in, we're not quite sold on the screen HP has used here, either. It's of the common 15.6-inch/1,366 x 768-pixel type, and while its colours and viewing angles were both adequate, there was some faint vertical striping apparent in our test unit's display, which means it's not as clean-looking as either the Apple or MSI equivalents.

The big Haswell question of course, is 'how long does it last?' For a mid-sized machine, the battery life on this Envy 15 is good – ranging from 2:36hr to 4:05hr, depending on what you're doing – though we wouldn't go as far as to call it great.

That longevity is aided by a good-sized 5,225mAh battery (and unlike the Air's, this one's removable), but the Envy's slightly more power-hungry parts clearly aren't as efficient as those in Apple's machine. A 4-hour battery life is something we regularly saw with Ivy Bridge notebooks, so the fact that Haswell manages it, too, isn't particularly exciting.



7/10 MSI GE70 20E

Haswell does gaming on the cheap.

au.msi.com @

\$1,699 \$

Good mix of parts for the price, decent gaming performance. ✓

Pitiful battery life, only two USB 3.0 ports. ✗

This final Haswell notebook has quite a few things in common with the previous HP Envy unit – both use the same 2.4GHz Core i7-4700MQ CPU combined with 8GB of memory and the 64-bit edition of Windows 8. Beyond that, they diverge pretty radically, because where the Envy 15 is designed to be a general purpose all-rounder, the GE70 is really built with one thing in mind: gaming. That's primarily made good via two elements: its 17.3-inch LED-backlit screen and a GeForce GTX 765M graphics chip to power it. Combined, they keep most games ticking along nicely on medium details at 1080p.

For the price, it's also reasonably well kitted out for storage, with a 120GB SSD for the OS (and storing your key games and apps), a 1TB platter-based disc for less-critical files, plus a Blu-ray writer. Add to that a nice big trackpad, clean and bright screen (with none of the striping issues we saw on the HP) and a sturdy, Steelseries-built keyboard. The chassis is all plastic, but if you're after a gaming laptop at this kind of price, that's par for the course.

However, it's a little disappointing that while the GE70 has four USB ports in total, only two of them are actually USB 3.0. That's a little perplexing, given that the HM87 chipset used here offers support for six of them.

The GE70 does have one other flaw that could undermine its appeal for some – poor battery life. Its big 17.3-inch screen

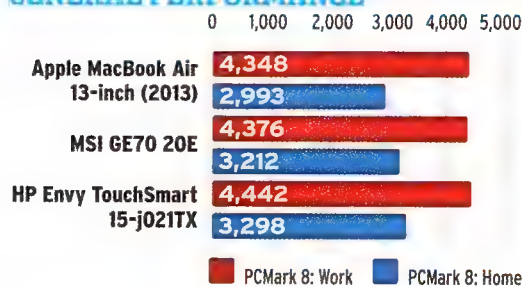
combined with that fast CPU and GPU can chew through power like a beast. It's something that's further undermined by the fact that MSI has only included a 4,400mAh battery – the smallest of the three we tested. As with the other two units, we used PCMark 8's 'Home' and 'Work' tests to get a rough battery range for the GE70 and it came out the poorest of the lot, by quite a margin. You can forget 'all day' (or even 'half day') battery life; at full tilt you'll be lucky to see 90 minutes, stretching up to 2 hours if you're doing lighter work. That's a far cry from the 7 hours and 4 hours (respectively) that the Air and Envy managed in the latter test.

If you were hoping all Haswell notebooks delivered battery life on par with their ultrabook counterparts, then you'll be in for some disappointment. Intel has undeniably made some great power savings with its fourth-gen Core chips and the accompanying chipsets, but as previously, the best battery life will still be found within a smaller subset of machines.

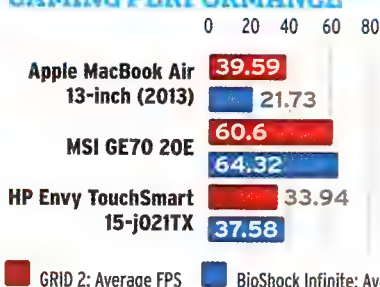
On the plus side, if you're looking for an all-rounder, then now might be a great time to snap up an Ivy Bridge model on the cheap. Head down to Harvey Norman, Dick Smith or JB Hi-Fi and you'll still find most vendors selling laptops (and even launching new models) based on last year's parts – often at a steep discount. Given the minimal performance increases offered by Haswell, these might not be so bad a deal after all.

LABS BENCHMARK RESULTS

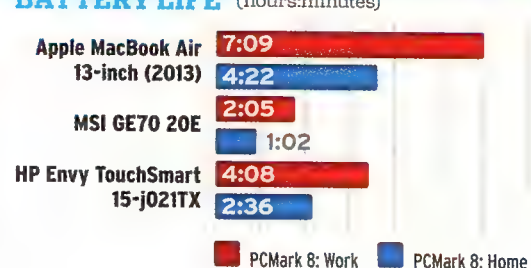
GENERAL PERFORMANCE



GAMING PERFORMANCE



BATTERY LIFE (hours:minutes)



Note: All games tested at 1,366 x 768 at medium/normal detail settings.



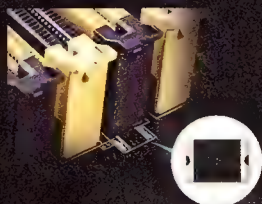
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One click for better performance, efficiency, digital power control, reduced noise and improve cooling

- TPU: CPU performance boost
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- DIGI+ Power Control: Precise DIGI+ Power control for Intel 4th generation Core processors
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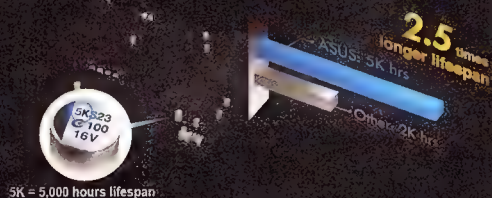
2



**Enhanced DRAM overcurrent protection
Short-circuit damage prevention**

Onboard resettable fuses prevent overcurrent and short-circuit damage. This extends beyond I/O ports to DRAM to safeguard system and device lifespan.

4

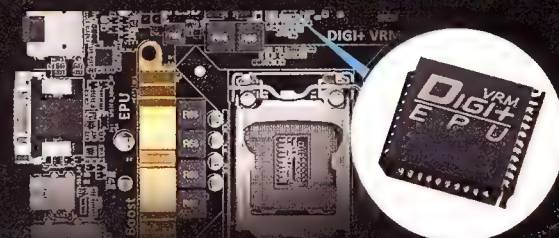


All 5K-hour solid state capacitors

2.5X longer lifespan with excellent durability

ASUS 5,000-hour solid state capacitors last 2.5 times longer than traditional capacitors. They pass strict testing and meet the highest standards to enhance durability and thermal capacity.

1



DIGI+ VRM

Precise power control and long-lasting stability. Quality voltage regulator modules (VRMs) deliver precise CPU power on demand. ASUS was first with a digital power design, featuring faster sensing and response, which improves system stability thanks to more consistent power delivery.

3



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Strong ESD protection for extended component lifespan

Offer active protection to ensure that electrostatic discharges are properly grounded to keep components safe, providing prolonged component longevity.

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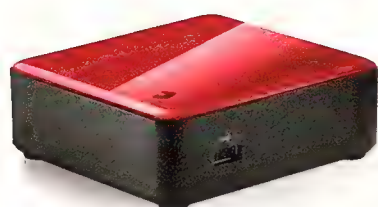


Stainless steel back I/O

3X more durable corrosion-resistant coating

ASUS uses strong and corrosion-resistant stainless steel to make I/O panels, which pass 72-hour salt spray endurance tests and have a usage life three times longer compared to ordinary panels.

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6 10 Altech NUC System

Is this the future of desktop computing?

SYSTEM

www.altech.com.au @

\$1,399 \$

Compact, quiet, powerful. ✓

Expensive, no USB 3.0, no spare PCIe slots. ✗

We've taken a look at Intel's Next Unit of Computing (NUC) in previous issues – this is the chip giant's vision for the next generation of desktop PCs, a tiny 10 x 10 x 5cm miniature machine with the power of a much larger computer. So far, it's mostly been pitched at hobbyists, with few retailers offering it as a prebuilt complete PC.

As a quick refresher, inside the NUC is Intel's D33217CK motherboard with a soldered-on 1.8GHz Core i3-3217U processor, Intel QS77 chipset and HD 4000 GPU. By default, the NUC is a barebones PC, so for this Altech Computers system it's been bundled with 4GB of notebook RAM (the NUC supports up to 16GB), a 120GB mSATA HDD, wireless Gigabyte keyboard and mouse, and the 64-bit version of Windows 8. The NUC has two mini PCIe slots (one half-height), but these are taken up by the SSD and wireless card.

The NUC takes a simple approach to physical connectivity, with three USB ports (one that's front-mounted), HDMI and Thunderbolt. Frustratingly, while the chipset supports USB 3.0, this version of the NUC only has USB 2.0 ports – perhaps it's Intel's attempt to push people towards using Thunderbolt. It also comes with a VESA mount if you want to get more creative with its location.

The NUC boots up incredibly quickly – from hitting the power button you can be ready to rock in just 6 seconds. In operation there's nothing to distinguish it from a full-size PC: it's fast and responsive. We ran our usual benchmarks and the NUC returned a 3,699 PCMark 7 score and managed 2,445 in 3DMark. While it can't compete with a full-size machine in terms of raw power, the NUC can keep up with laptops and will happily run your favourite desktop programs or casual games and can output HD video with aplomb. Its power draw is similar to a laptop – we tested the NUC with a power meter and found it drew 11W when surfing the net and 19W at full tilt. Under load a cooling fan will kick in, but mercifully it's quiet

enough to be almost inaudible (unless you're very close).

The system includes a Dell S2340T touchscreen monitor, which packs a 23-inch IPS panel running at 1,920 x 1,080. The colours and viewing angles are top-notch, there's zero light bleed and you even get speakers, a USB 3.0 hub and a webcam. When coupled with the NUC, that touchscreen can give you a flexible all-in-one setup, but one where the PC offers some upgradability. Microsoft has gone to great lengths to improve touchscreen accessibility on Windows 8 and while it can be useful for some games or programs, desktop tasks are still generally much faster with a mouse.

This NUC would make an excellent (albeit expensive) media PC/NAS combo, if only it had USB 3.0. While external storage can be handled by Thunderbolt, the choice of Thunderbolt external drives is much more limited than USB 3.0 models. While it's very small, the NUC is still competing with low-end laptops, which while larger, can offer a lot more bang for buck as well as an integrated screen.

If you prefer a more DIY approach, you can also buy the NUC as the barebones system. In the most basic configuration it doesn't come with RAM, SSD, Wi-Fi/Bluetooth module, power cord (though the power brick is included), operating system or keyboard and mouse. Barebones systems start from around \$399, which is pretty good considering a fully-spec'd unit costs over \$700.

While it's reasonably powerful, it still has a number of flaws. For one, it's a little expensive for the hardware on offer (admittedly, that'll be the case even if you spec it out yourself), but it also misses a few crucial features such as USB 3.0. We don't see the NUC form factor taking over just yet, but this Altech unit potentially offers an excellent package for niche use such as a touchscreen kitchen PC, or perhaps the brains behind a commercial kiosk or interactive video display.

Lindsay Handmer

9 10 Crucial M500 480GB

The solid state of things to come.

SOLID-STATE DRIVE

www.crucial.com @

\$460 \$

Large capacity, excellent value. ✓

None. ✗

Crucial's latest range of SSDs, replacing the highly successful M4 series, is here. The M500 family consists of four capacities: 120GB, 240GB, 480GB and the flagship 960GB. That top drive is the first terabyte-class SSD aimed at consumers and it makes it one of the most important ranges to arrive on the market, because it gives us a glimpse of what the future might hold when it comes to the cost-per-gigabyte pricing of SSDs.

Crucial's new drives can do this because they use the latest development in NAND technologies: 128GB (16GB per 2-bit MLC die) density chips. Why is this so important? Well, 128GB density NAND holds the promise of allowing for large-capacity SSDs at competitive prices in the consumer market space – something of a holy grail for SSD manufacturers.

To push home the advantage of this special high-density NAND, Crucial hasn't held back with its pricing, especially for the two largest capacities. The 480GB drive we're looking at here was \$460 at the time of writing, while the 960GB is an astonishing \$750. That latter works out to be around 78c per GB, making it a potential game-changer.

However, new NAND isn't the only thing the M500 brings to the table. It's also got a couple of other tricks up its sleeve – ones usually only found in proper enterprise SSDs.

The good news here is that you get the added protection normally associated with enterprise devices in a drive that's aimed at us mere mortals. First up, these drives have their own power backup. Looking at the drive's PCB, there are a couple of rows of capacitors, which (if the data is already in the NAND) enable the drive to finish any writing duties should your rig crash through power failure or some other BSOD moment. There are also proper thermal controls, so if it hits above 70°C, the drive will throttle back by around 40% until it returns to a stable working temperature.

The 480GB M500 uses 16 of those new NAND chips (eight per side of the PCB), with two dies per NAND package, giving it a total capacity of 512GB. Crucial uses the spare capacity to sort out any NAND defects and its RAIN (Redundant Array of Independent NAND) technology. Looking after everything is a Marvell 91878 NAND memory controller, although the firmware is Crucial's own and it's the natural development of the one written for the M4 drives.

Crucial quotes a sequential read speed for the 480GB drive of 500MB/s (the same as all the other drives in the range), while the sequential write speed is quoted at 400MB/s. That's a tad on the conservative side when compared with the results we got from the ATTO benchmark – 539MB/s for sequential reads and 429MB/s for writes.

Crucial's M500 series offers a glimpse of what the future might hold with the pricing of large-capacity SSDs and it's a sign of how far the market has come in a short space of



LABS BENCHMARK RESULTS

SEQUENTIAL READ PERFORMANCE

AS SSD / MB/s
(bigger is better)

Crucial M500 480GB	488
Crucial M4 512GB	493
Seagate 600 480GB	513

SEQUENTIAL WRITE PERFORMANCE

AS SSD / MB/s
(bigger is better)

Crucial M500 480GB	408
Crucial M4 512GB	259
Seagate 600 480GB	437

1080P GAMING PERFORMANCE

AS SSD / MB/s
(bigger is better)

Crucial M500 480GB	59.6
Crucial M4 512GB	83.1
Seagate 600 480GB	54.4

time. If you'd have said barely a year ago you'd be able to buy a 480GB SSD for under \$500, several people in white coats would've escorted you to a nice padded cell.

Simon Crisp



7/10 Gainward GeForce GTX 760 Phantom

It's whisper quiet! (Really.)

GRAPHICS CARD

www.gainward.com @

\$339 \$

Near-silent cooler, fans can be removed for cleaning. ✓

Outperformed by the GTX 670, high initial pricing. ✗

Nvidia's been on a bit of a release rampage over the last couple of months, churning out three new enthusiast-pitched 700-series graphics cards with its latest, the GTX 760, slotting in at the bottom of the pack. This Gainward model is first of the latter to land in our Labs.

To quickly recap, all these 700-series cards (the 760, 770 and 780) are still based on the same Kepler architecture as last year's 600s, but Nvidia has fiddled with CUDA core counts and clock speeds to come up with these new(ish) variants. By and large, they do outperform both their predecessors and, perhaps more importantly, their AMD equivalents.

Design-wise, the new 760's approach essentially boils down to 'less brains, more brawn'. The GTX 770 is just a reworked version of the GTX 680 and in the 760's case, what you're really getting is a tweaked GTX 670. The 760 tweaks the 670's design by dropping from 1,344 to 1,152 shader processors, while attempting to compensate by cranking up the GPU core base/turbo speeds from 915/980MHz to 980/1,033MHz, respectively. As on the 670, there's 2GB of DDR5 memory, clocked at the exact same 6,008MHz.

How much difference do those minor changes make when it comes to real-world frame rates? Not a whole lot, to be honest – and moreover, that extra clock speed doesn't quite do enough to balance out the reduced number of processors. There are a handful of games and tests where the 760's extra clock speed is able to trump the 670's additional core, but in most cases the latter comes out ahead – though only by a couple of frames per second.

To its credit, Gainward has put together an attractive piece of kit with this Phantom card. As the name suggests, it's built to be as quiet as possible and uses an enormous triple-slot cooler to achieve it. Though that cooler does have two fans,

they're reasonably compact and near-silent in operation, and noise reduction is further aided by the fact that they're slotted in between the card and the grill-heavy (and heat pipe-laden) heatsink. Those fans still blow in the standard direction, meaning they pull air through the grill/heatpipe array and blow it down onto the GPU heatsink. That technique works reasonably well, keeping the GPU at around 70°C at full tilt – though it's not nearly as efficient as the more traditional HSF on the N770 Lightning, opposite. If you're after a high-end card to slot into a media PC though, this'll do the job nicely. Those fans' power connectors are also socketed, so they can be easily pulled out for fuss-free cleaning.

In broader terms, the fact that AMD's still running its 7900-series promo does put the GTX 760 in a slightly uncomfortable spot. (That promo bundles in a bevy of recent-release AAA games, including *BioShock Infinite*, *Crysis 3* and *Tomb Raider* with purchase of a 7900-series card.) With Radeon HD 7970s selling for around \$400, that does make for an awfully tempting counter-offer from the red team. At current pricing, the GTX 760 is therefore caught in a bit of a no-mans land. When prices drop closer towards the \$300 mark its appeal will undoubtedly grow, but until then, a GTX 670 or (if you can stretch to it) an HD 7970 is the better buy.

Dan Gardiner

LABS BENCHMARK RESULTS

GPU TEMPERATURE

Peak / Idle °C 0 20 40 60 80 100

AMD Radeon HD 7950 (OEM)	70
ASUS GeForce GTX 670 DirectCU Mini	30
Gainward GeForce GTX 760 Phantom	72
	24
	70
	25

NOTE: Peak Idle

BIOSHOCK INFINITE

0 20 40 60 80 100

AMD Radeon HD 7950 (OEM)	43.21
ASUS GeForce GTX 670 DirectCU Mini	71.81
Gainward GeForce GTX 760 Phantom	51.4
	85.68
	50.27
	83.51

NOTE: 2,560 x 1,600, UltraDX11 1080p, UltraDX11

METRO: LAST LIGHT

0 20 40 60 80 100

AMD Radeon HD 7950 (OEM)	25.8
ASUS GeForce GTX 670 DirectCU Mini	39.6
Gainward GeForce GTX 760 Phantom	30.33
	46.33
	28.67
	45.5

NOTE: 2,560 x 1,600, Very High 1080p, Very High

GRID 2

0 20 40 60 80 100

AMD Radeon HD 7950 (OEM)	49.15
ASUS GeForce GTX 670 DirectCU Mini	69.37
Gainward GeForce GTX 760 Phantom	47.57
	69.53
	50.32
	76.99

NOTE: 2,560 x 1,600, Ultra 1080p, Ultra



8/10 MSI N770 GTX Lightning

Not actually burning up the quarter mile.

GRAPHICS CARD

au.msi.com @

\$600 \$

High factory over clock, quiet and cool running.

Premium priced, 7970 GHz is arguably better bang for buck. *

MSI's Lightning-branded graphics cards cost more than the majority of their counterparts, but there's a justified reason for that: they've developed a solid overclocking reputation over the last five or so years, with MSI typically only producing one or two for each generation. Locally, GTX 770s start at around \$470 on the street, so what do you get for the extra \$130 MSI is asking for this one? As with its forebears, this is a card that's designed to push GPU speeds well above the norm – even without you having to do any overclocking yourself.

That said, we should point out that it's basically impossible to find any GTX 770 running at stock clock speeds – as we mentioned in the Gainward 760 review, both of these GPUs are essentially tweaked 600-series boards, so graphics card makers have already had a year to polish their Kepler designs. In MSI's case, that's allowed its engineers to crank up the base and boost GPU clocks of the Lightning from the 770's 'standard' 1,046/1,085MHz to 1,150/1,202MHz, respectively. That's higher than the 5-7% that most of MSI's competitors are willing to push, but still in the range of 'safe' overclocks, amounting to a humble 10% bump overall. While that puts it

ahead of its 770 counterparts, there are areas where a \$400 AMD Radeon HD 7970 comes close to matching it.

Alongside that modest factory overclock, you also get a card that's decked out with just about every possible extra a tweaker could ask for (sans perhaps water cooling). This includes high-grade electrical components (MOSFETs, capacitors and chokes), unlocked voltage controls on GPU and memory for pushing overclocks higher, plus metal plates covering most of the front and back side of the PCB to help siphon off as much excess heat radiating from those premium components – and the memory – as possible.

The Twin Frozr IV cooler on the N770 is one MSI's used on several previous Lightning cards, but it still holds its own. In testing at stock clock speeds, it kept the GPU temps down to a very reasonable 63°C under load (in our admittedly icy test Labs), leaving ample headroom for further overclocking.

Given that at its stock clocks, the Lightning is as quiet as the dead – especially once inside a decent PC case – you might not really want to push the card any harder. Even when playing *Metro: Last Light* on a 30-inch display with all the bells and whistles turned up to Ultra, the low rush of sound from those fans was essentially inaudible.

If you want one of the fastest factory-overclocked 770s around – with a build-quality to back up further tweaking – and you're prepared to pay, this is a ripper of a card. If all you're after is the most frames possible at the lowest price, there are GTX 770s and Radeon HD 7970s that offer better bang for buck.

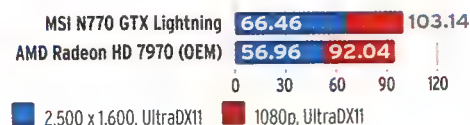
Dan Gardiner

LABS BENCHMARK RESULTS

GPU temperature: Idle/Peak



BioShock Infinite:
2,500 x 1,600, UltraDX11 /
1080p, UltraDX11/



Metro: Last Light
2,500 x 1,600, Very High / 1080p, Very High



GRID 2:
2,500 x 1,600, Ultra / 1080p, Ultra



Tomb Raider:
2,500 x 1,600, Ultra / 1080p, Ultra



8/10 D-Link DIR-865L

How does D-Link's fastest-ever wireless router shape up in the 802.11ac competition?

WI-FI ROUTER

www.dlink.com.au @

\$199 \$

As fast as money can buy, cloud storage and parental control built in, fairly priced. ✓

Setting up secondary features can be a little complex. ✗

One after the other, we've seen all the major router vendors release new 802.11ac flagship routers over the last year. Now with the DIR-865L, it's D-Link's turn to release a router designed to send your wireless into overdrive.

In case you haven't been paying attention, 802.11ac is the new wireless standard that's roughly three times faster than 802.11n. It uses a host of new tricks – the 5GHz radio band, wider channels and new encoding – to achieve those speeds. It's also backwards-compatible with 802.11n devices.

An imposing tower of black plastic, the DIR-865L supports full 1,300Mbps 802.11ac, currently the fastest speed available. It also supports 450Mbps 802.11n for any wireless N devices you might still have. And when it comes to wired connectivity, it has Gigabit Ethernet support on all ports, including the WAN port, meaning this router is NBN-ready.

So in theory at least, it's a very fast router. The good news is that it's fast in practice as well. Tested using a Cisco Linksys WUMC710 as a wireless client, we managed to copy a file across the wireless connection at 58.7MB/s at a range of 5m, which compares well to a Cisco Linksys EA6500 and Netgear R6300 we tested previously, and even comes close to rivalling the kind of performance you'd get over wired Gigabit Ethernet. Unfortunately, it didn't have quite the same range characteristics as those other two routers, falling away faster at 10m and 15m; however, it still massively outperformed any 802.11n router at all those ranges.

Moving beyond pure performance, the router's feature set is certainly solid, with parental controls, remote access, Quality of Service (QoS) and advanced logging and notifications. Its administration tools are impressively comprehensive, with relatively simple internet and wireless wizards for non-technical types, along with detailed settings for more advanced tinkerers. It would have been useful to have wizards for cloud storage and other features as well, but at least there's a handy live help guide to walk you through the settings.

Speaking of the cloud, the router comes with a very simple cloud storage service offered by D-Link. No, D-Link doesn't have any online storage service à la Dropbox or SkyDrive, but it does have an authentication and bridging system that lets



you access attached USB hard drives remotely. To be blunt, the setup process can be a little arcane, but the final result is solid, letting you access your documents from anywhere you need to. There are even apps for iOS and Android that let you access shared media content on your mobile.

Meanwhile, parental controls are managed entirely through DNS. The router has a built-in link to OpenDNS (opendns.com), a free DNS service that can filter web site address requests of objectionable sites. It's a relatively simple solution, blocking only domains and not individual pages, as well as being relatively easy to work around using manual DNS settings on the client computer, although as a baseline solution for parental control, we're all for it.

Ultimately, though, if you're buying this router, you're buying it for speed and it certainly offers that. It's not the final word in router design and there are certainly things we'd change about it if we could, but if you're looking to upgrade to 802.11ac, it's a solid choice that won't break the bank.

Nathan Taylor

7/10 D-Link DWA-182 802.11ac adapter

WI-FI ROUTER

www.dlink.com.au @

\$65 \$

In addition to the DIR-865L router, we also managed to get our hands on the DWA-182, a rare USB adapter for the new 802.11ac standard. As we saw with the previously reviewed Netgear A6200 Wi-Fi USB Adapter, lack of internal antenna space means the performance of the stick is limited. It can only



hit 867Mbps in 802.11ac and technically, even less than that because it's still only USB 2.0, which supports a maximum of 480Mbps. Live testing it with the DIR-865L produced copy speeds of 23.1MB/s at 5m, 17MB/s at 10m and 8.8MB/s at 15m – not bad, but well below what the router is really capable of.

8/10 Billion BiPAC 7800NXL

A router for people who like to tinker.

ROUTER

au.billion.com @

\$155 \$

Tremendously configurable, great for non-standard environments. ✓

Can be technical to set up. ✗

Whatever your flavour of broadband, the new Billion BiPAC 7800NXL has you covered. It has an ADSL 2+ port built in. If you have cable or NBN fibre, one of the four Gigabit LAN ports can be reassigned as a WAN port. If you need occasional or continuous 3G/4G LTE-based internet access, you can plug a 3G modem into one of its USB ports and share the 3G network around your home.

As we've come to expect from Billion, there's also tremendous granularity when it comes to setting things up. Every setting can be checked, tweaked and configured if you've a mind, from virtual LAN segmentation to IPv6 routing, to QoS and remote management settings. Even sharing USB drives attached to its single USB port offers a more sophisticated setup than we're used to in consumer routers, and it includes full SMB, DLNA/UPnP AV and FTP support.

However, if you have no idea what any of those acronyms we just used mean and have no desire to ever do so, this may not be the router for you. What Billion offers in fine-grained control it sacrifices in simplicity and ease of

use. Yes, there are some basic internet and wireless setup wizards, but even a casual look at the web administration page is likely to be terrifying for non-technical users.

The router's wireless support is also a little disappointing. Not only does it lack 802.11ac, it can't even manage the fastest speeds that 802.11n has to offer, being limited to just 300Mbps and proving considerably slower than similar routers we've tested even at that speed. It's also single-band only, meaning it works only in the 2.4GHz band. On the upside, a great many wireless features are available that you don't commonly find, including multiple SSID setup for client isolation and WDS repeater capabilities.

Much as with the router's other features, Billion's wireless provides versatility if not raw grunt. If you're looking to set up a network that's a little exotic but doesn't necessarily need the greatest speeds, the Billion is a very good option indeed.

Nathan Taylor



8/10 TP-LINK TD-W8980

An affordable NBN-ready ADSL router.

ROUTER

www.tp-link.com.au @

\$110 \$

Affordable, good wireless performance for an 802.11n device. ✓

The interface is likely to send non-technical users running. ✗

TP-LINK's routers are better known for their affordability than their power or ease of use and it's fair to say that the new TD-W8980 ADSL modem router continues in that tradition. Available for street prices of less than \$120, the TD-W8980 is certainly a good deal for the hardware and feature set that's on offer.

Unfortunately, that hardware doesn't include 802.11ac support. The router is limited to dual-band 300Mbps 802.11n, transmitted from three honkin' 5dbi antennas sticking out of the back of its space-agey chassis. Those antennas drove it to some very solid results in our straight-up copy tests, beating both the Billion BiPAC 7800NXL and a Netgear DGND3700 in terms of throughput, but not even coming close to challenging any 802.11ac router we've tested.

Its wired support, on the other hand, is top-notch. All four LAN ports are Gigabit and as has become the trend, one of those can be reconfigured as a WAN port should the need arise. That need, of course, is most likely to be the NBN and you won't have to throw out your TD-W8980 when the NBN rolls around.

We've been critical in the past of TP-LINK's firmware and



the truth is that it's gotten a little better. The router comes with a relatively easy-to-use setup CD that will configure your basic internet and wireless settings, and get the device up and running. However, if you want to configure some of the more advanced capabilities on its extended feature list, like file or printer sharing from the two USB ports, parental controls, QoS or IPsec VPNs (a very rare feature indeed in a consumer router!), you'll have to face the web-based administration console. Here, you'll be bombarded with unfiltered jargon and acronyms, and will really need to know your stuff.

Ultimately, as with Billion's routers, this probably isn't a product we'd recommend to our techno-phobic grandmothers, but if you like having a great deal of control and aren't scared off by networking jargon, it's not a bad option at all.

Nathan Taylor

8
10

Astro A50 Wireless Headset

A plug-and-play wireless gaming audio system for a song. Uh, make that an album.

GAMING HEADSET

www.astrogaming.com @

\$348 \$

Great sounding and easy to set up wireless audio for PC, Mac and all current-gen consoles, comes with all requisite cabling.

Expensive, no Media Cable for on-the-go audio. ✗

Sitting at the top end of the Astro headset range is the gaming and media-enthusiast wireless A50s, which offer out-of-the box Dolby 7.1 Surround audio for both PC and Mac as well as both of the main current-gen gaming consoles. The A50s seem almost identical to the less-expensive A40s, sporting the same bombproof, utilitarian construction, styling and snug fit. There's plenty of room for adjustment and the cloth-clad circumaural cans offer isolation and enough breathability to allow for almost indefinite use. Cramped in the left can is the flawless 5.8GHz KlearNet wireless receiver, rechargeable Li-ion battery charge port and boom mic; the right houses the power and volume controls as well as an EQ presets switch. There are three distinct modes – Media, Core and Pro – which basically boils down to bassy, flat and trebly.

The potatoes to the meat of the A50s is the USB-powered transmitter, the MixAmp Tx, which connects to your playback device via the provided optical TOSLINK cable. There's also



optical out, which can act as an audio pass-through if you're home theatre oriented. It's literally the easiest set up we've encountered. The Achilles' heel, however, comes when you want to leave the house. There's an auxiliary port which lets you plug a music player (be that tablet, smartphone, iPod or other) into the MixAmp to stream music to your headset. That sounds great, but we'd honestly have traded this for a 3.5mm Media Cable solution similar to that of the A40s. The latter lets you plug the headset directly into a music device, so you can watch iPad movies or listen to music on-the-go, which makes the A40s good for travel, too. Adding that mobility feature to the A50s would provide far more utility. While you won't be disappointed with the A50s, unless you desperately need wireless cans to use at home, we'd still recommend the A40s.

Troy Coleman

7
10

Turtle Beach EarForce Z7

A beautiful yet bewildering tournament-grade headset.

GAMING HEADSET

www.turtlebeach.com @

\$349 \$

Gorgeous and great sounding for PC, can be used on-the-go as a regular headset.

Set-up was a pain, console compatibility requires an additional outlay for the console interface. ✗

Wow, what a gorgeous headset the Z7 is. A beautifully stitched and generously padded supple leather headband combines with robust joinery throughout and the classic Turtle Beach cup rotation system, along with just-as-generous leatherette-padded, closed-back cans. The only real negative here is that once on the head – like we've found with all Turtle Beach headsets – they tend to clamp a little aggressively. However, getting the Z7 up and running is far from the delight its looks promise. That starts with a gobsmacking number of cables, with a 9-pin PC cable, 3.5mm AUX, headset breakaway, Audio Control Unit (ACU) extender and mobile adapter all included in the Z7's box. We're no strangers to setting up complex headsets, but this one was such a pain that we required help from the instructions and then further support from Turtle Beach.

Now that I've already disgraced myself by mentioning instructions were needed for set-up, I won't even mention the ape-like impersonations and head-scratching when tackling the brains of the beast – the ACU. However, regardless of how heavy, unintuitive and bewildering it may be (keep those



instructions close) it's also insanely powerful and allows not only the standard array of signal fine-tuning, but also lets you adjust the angle of the front and rear surround speakers to get the ideal 5.1 sound and 3D-positioning for you.

Once the Z7s start pumping out the sweet sauce, there's a genuine wow moment as the rich, un-muddled bass, mids and crystal clear trebs hit the ears. But even though they're a delight on the ears, the expense and awful set-up process outweighs any purchase recommendation we could give.

Troy Coleman

8/10 LG Optimus F5

Has all the bells and whistles... from 2010 at least.

SMARTPHONE

www.lge.com.au @

\$315 \$

4G capable, inexpensive. ✓

Cheap build, 900MHz only for 3G. ✗

The LG Optimus F5 is a budget range handset, so that means in some ways it must be rubbish, right? Not necessarily. For a start, this is a good-looking handset considering the \$300-odd price bracket it sits in; comparison with the white iPhone design is inevitable, but it certainly beats anything else in this kind of price range. Underneath the L5's 4.3-inch 540 x 960 IPS display is a 1.2GHz dual core processor and 1GB of RAM. That's not stunning by any approximation and it led to a mid-range Geekbench 2 score of 1,579 in our tests. When you factor in that the F5 is 1800MHz LTE capable, it does get a bit more interesting, though.

There are tradeoffs; the onboard storage is low, the camera is quite basic and LG's own included applications are better for novelty value than actual usage thanks to the low-resolution screen. The only shortcoming that really concerned us, however, is that while it'll handle anyone's 1800MHz FD-LTE network, in the 3G space it's 900MHz only, which explains why it's with Optus and subsidiary Virgin. That's a concern if you are buying outright and want to switch networks, because if you do, you'd have to live exclusively under a 4G cloud, or suffer 2G data speeds elsewhere.

Still, the F5 is worth its asking price, and it's a great signal for how features that were premium only a very short time ago have become expected. That makes it a good buy, as well as a significant pressure point on premium phones to deliver even more.

Alex Kidman



8/10 Sony Xperia SP

A stripped back Z with better battery life to boot.

SMARTPHONE

www.sony.com.au @

\$499 \$

4G capable, good battery life. ✓

Non-removable battery, middling internal storage. ✗

The Xperia SP is Sony's mid-range phone, designed for those who can't – or won't – pony up for the full Xperia Z experience. And it does show, with a phone that looks an awful lot like the Z, but in a cheaper plastic body. There's no waterproofing, the camera is a little more ordinary and the screen is a notably lower resolution of 1,280 x 720 pixels on a 4.6-inch panel. Underneath sits a 1.73GHz dual-core Qualcomm processor, 1GB of RAM and a relatively mediocre 8GB of storage, although you can push that upwards with a microSD card. Android 4.1 is onboard, but Sony doesn't do a whole lot with included apps, though that's an approach we generally prefer with a flexible operating environment like Android.

What you can't do, despite the back of the SP being removable, is swap out the 2,370mAh battery. For some reason, Sony decided to fuse it in place. Battery life was a big problem for the Z, solved only with its 'Stamina' mode that disabled just about everything but calls and SMS. The SP offers Stamina mode, but in our testing it rarely actually needed it, lasting through a day where the Z would often falter. Its internal processor is a little less flashy than that of the Z, but it slightly outpaced it on Geekbench 2, with a score of 2,124 to the Z's 1,991.

The SP sits in a mid-range price point and while it doesn't offer some of the Z's headline features, it's arguably a better value proposition if you like your Android with a Sony twist.

Alex Kidman





6 10 Dell UltraSharp U3014

Dell's new top-end display gives great visuals. Well, some models do.

MONITOR

www.dell.com.au @

\$1,799 \$

Big, beautiful and bright, excellent visual quality. ✓

Pricy. ✗

Bigger is always better, we often hear, and when it comes to monitors this is often true. The increased screen real estate is a boon for productivity and if you're so inclined, gaming as well. In fact, even this 30-inch productivity-focused beast has a 'Game' preset, but we'll come back to that in a moment.

At 641 by 400mm, the U3014 is Dell's largest display, with a price point to match. With a native 2,560 x 1,600 resolution and 6ms grey-to-grey response time, the U3014 provides excellent definition with minimal ghosting in both productivity apps and games, although some may find the default font size of Windows too small at first glance. That's easily rectified by increasing Windows's scaling options, though.

Unlike its predecessor, the U3011, which we had in the Labs to compare, the U3014 is LED-backlit, providing an increased contrast ratio leading to richer colours and blacker blacks. In fact, on paper the U3014 is superior to the U3011 in every respect. Unfortunately, it's not without its own problems.

The most obvious of these is an odd black-lined gradient that's most notable at the lower half of the screen, creating a scan-line effect. As it turns out, this is actually a known fault with some U3014 units, including our own test unit. It's a problem that's acknowledged by Dell, but at the time of writing, no fix had yet been announced.

That glaring issue aside, the U3014 comes with a range of preset modes for multimedia, movie, industry-standard colour profiles (including Adobe RGB and sRGB) and the aforementioned gaming. The latter is interesting by virtue of the fact that it disables most internal processing in an effort to reduce input lag, and in our testing it works surprisingly well. However, this mode also forces on Dell's 'Smart Video

Enhance', a feature that's optional for the 'Movie' preset. Why is this bad? Because it's neither smart nor does it enhance visual fidelity – in an attempt to further increase contrast, it creates a noticeable crawling moiré effect up the screen, which is simply distracting and appalling for a monitor of this calibre. The side effect is that it also makes the gaming preset mode largely useless. Why, oh why, Dell?

Back in the good camp and in its favour, the U3014 uses both less power than its predecessor and does so while providing much increased brightness – the U3011 on 100% is roughly equivalent to the U3014 on 50% and still provides better contrast. Another improvement is a reduced antiglare coating, helping the U3014 to appear sharper and clearer compared to its predecessor.

In terms of connectivity it's also a winner, with DVI-D, HDMI, DisplayPort and Mini DisplayPort connections. It also sports a built-in USB 3.0 hub with four ports.

With 16:10 monitors a rarity today, the U3014's size and resolution make it perfect for those who value screen real estate for work or play. Compared to the previous U3011 model, it's an improvement in every way – except, of course, for the scan-line issue present on our unit. And we'd argue that this kind of problem is ultimately unacceptable, given the premium price you pay. With no fix announced at the time of writing, it's hard to recommend the U3014 unless you're willing to play the lottery to see if you get a defective unit. Our model was the A00 revision, but it's still present on A01, so if you're in the market for one, we'd advise waiting for A02 or later.

Ashton Mills

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7 10 AMD A10-6800K

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CPU

www.amd.com @

\$170 \$

Slightly improved overclockability. ✓

Performance isn't significantly better than its predecessor. ✗

AMD has made a promise to release the world's fastest APU every year and to keep up with the target it's set itself. AMD has now released the desktop Richland APUs. As an update to the previous Trinity desktop APUs, the new Richland chips, with this A10-6800K leading the charge, are indeed the fastest APUs around.

Since Intel still markets its chips with integrated graphics as simply CPUs, AMD is pretty much on its own when it comes to producing what it likes to call accelerated processing units (APUs) – it's really only competing with itself.

To be perfectly honest, we could have happily skipped over this Richland update to AMD's APU range. If you were hoping for Graphics Core Next (GCN) architecture being squeezed into these new chips, you'd be disappointed. You'll also be disappointed to hear that there are no architectural improvements to the CPU components either, so we're still stuck with Piledriver modules and only two of them to boot. That means we're still talking about an APU with four AMD 'cores'.

AMD is saying it is 'building on the strengths of the Trinity design', though all we can really see here is some higher clock speeds and nothing that really stands out as a reason to give this a new generational name. We wouldn't even want to call it Trinity 2.0 – sadly, we're thinking more of a 1.5 update at best.

We can forgive the lack of Steamroller cores and HSA compatibility, which is something still in the boiling pot for future APUs, but we've had GCN for almost two years now. Why AMD's APU range, 'one of AMD's fastest growing categories' according to its own press, is still languishing with the aging VLIW 4 architecture is beyond us.

The Radeon HD 8670D in the A10-6800K is running at 844MHz with its 384 shaders, compared with the A10-5800K's HD 7660D at 800MHz with 384 shaders. You can see why all you're actually getting in the gaming benchmarks is an extra couple fps at best with these 'new' 8000-series integrated graphics cores. The A10-5800K is just as capable as the A10-6800K at running 2,133MHz RAM, so even this new headline memory support spec doesn't deliver anything extra for Richland over Trinity.

The only place where Richland does deliver over the original Trinity APUs is in the overclocking department. We managed to squeeze an extra 200MHz out of the A10-6800K compared with the 4.6GHz maximum the A10-5800K was running at.

We understand why AMD felt it needed to accompany the Richland mobile APU launch with some desktop updates, but for some it's a generation we can comfortably let pass us by. It doesn't really offer anything new over what's already out, so our hopes for



LABS BENCHMARK RESULTS

CPU RENDERING PERFORMANCE

Cinebench R11.5 / Index score
(higher is better) 0 2 4 6 8 10

AMD A10-6800K	3.58
AMD A10-5800K	3.29
Intel Core i5-4570	6.16

1080P GAMING PERFORMANCE

BioShock Infinite / fps
(higher is better) 0 5 10 15 20 25

AMD A10-6800K	25
AMD A10-5800K	24
Intel Core i5-4570	15

1080P GAMING PERFORMANCE

DiRT Showdown / fps
(higher is better) 0 10 20 30 40 50

AMD A10-6800K	43
AMD A10-5800K	41
Intel Core i5-4570	31

gaming APUs are still a generation away. So, while we wait for Kaveri, with its promise of HSA support, GCN cores and Steamroller architecture, we can pretty much ignore the presence of this 'update' on the desktop.

Dave James

9
10

Zalman LQ310

Bargain liquid chilling with high-end performance.

CPU COOLER

www.zalman.com @

\$85 \$

Cheap, small, provides excellent cooling. ✓

Dodgy mounting system, no extras. ✗

Water cooling your CPU is all the rage these days and now that these sorts of closed-loop liquid chillers have taken all the hassle out of fitting some wetware in your rig, there's no excuse to stick with air cooling. And when you consider the relatively weak overclocking performance of the new Haswell chips, Zalman's new water cooler, the LQ310, is able to make a strong case for itself, especially given its budget credentials and impressive cooling ability.

Zalman has been in the cooling business for many a year and it's been selling liquid cooling solutions for a good while, too. So, we were a little disappointed to find out Zalman had just employed the same Asetek cooling design as companies like Thermaltake and Antec.

That means it's still got the same rather wonky mounting system, which is a little awkward to fit, but relatively solid. Unfortunately, it can become a nightmare to remove if you're changing your CPU or motherboard because the mounting bolts the water block screws into are held in place by weak plastic surrounds. A couple of times using this system we've found the bolts simply spin around in place, leading to a frustrating mangle of pliers, screwdrivers and swearing trying to get the thing to let go of the motherboard.

Despite all that, Zalman has done something special to the setup that makes it way more appealing than the Antec Kühler. Against the 920 version, with its push-me/pull-you dual-fan setup, it makes for a more effective CPU cooler. In terms of straight temperature numbers on our Ivy Bridge test bench, it was outperforming even the 240mm radiators of the Corsair H100i at its default settings. That's impressive given that it's half the price.

Where it can't compete with the larger radiator coolers, and where all 120mm radiators suffer, is in the time it takes to return the CPU back to its idle temperatures after being fully loaded. At the stock-clocked settings of the Core i7-3770K we tested it with, the LQ310 was still ahead of both the Antec and Corsair 120mm coolers in terms of getting temperatures back down again. Overclocked up to 4.5GHz, though, the Corsair H60 impresses in peak-to-idle performance.

However, when you consider that this budget liquid chiller is still able to compete, and at some points beat, other more expensive coolers, it's clear Zalman has made some impressive tweaks. Sadly, the budget leaning means you're not going to get high-end extras such as USB integration and fan control.

When you're getting this sort of performance and some really low noise levels, it's tough to argue against this excellent little cooler. And when the latest Intel chips



LABS BENCHMARK RESULTS

INTEL CORE I7-3770K AT STANDARD CLOCKS

Full CPU load / °C
(lower is better)

Zalman LQ310	53
Corsair Hydro H60	56
Antec Kühler H20 920	56

PEAK-TO-IDLE PERFORMANCE

Full CPU load / Seconds
(quicker is better)

Zalman LQ310	93
Corsair Hydro H60	147
Antec Kühler H20 920	240

INTEL CORE I7-3770K OVERCLOCKED TO 4.5GHZ

Full CPU load / °C
(lower is better)

Zalman LQ310	69
Corsair Hydro H60	74
Antec Kühler H20 920	77

aren't hitting the sort of overclocking levels of the previous generations, are we going to need anything more advanced than this sort of 120mm chiller?

Dave James



8/10 Corsair Obsidian 350D

Corsair brings all the fun of a full-scale form factor.

CASE

www.corsair.com @

\$130 \$

Small yet roomy, excellent layout, easy access to CPU cooler. ✓

A little pricey. ✗

Why do people buy small form factor motherboards? We asked ourselves this as we pulled the new Obsidian 350D from its snug cardboard box. Normally, it's so they can create small form factor PCs with their diminutive motherboards. So what's so special about a chassis that's only a little smaller than a standard tower case and is still going to have to be shoved under a desk rather than under a TV?

Well, what we really should have been asking is why do people buy full ATX motherboards? When you've got mini-ITX boards like the ASUS P8Z77-I Deluxe and micro-ATX boards such as Gigabyte's latest G1.Sniper M5, you can create smaller-scale gaming PCs without having to compromise on performance. With the overclocking prowess of the latest mini boards it's really only the multi-GPU faithful and the really extreme overclockers who are going to want the extra goodness you can get with a top-spec, full-scale ATX motherboard.

So, unless you have a vast rack of hard drives to fill your computer with, you might as well opt for a chassis that isn't such a monstrous space hog around your desk.

Corsair's stylish little 350D is a perfect choice for that. It's a case that's laid out to cater for those small-scale motherboards, but with enough space for two of the longest graphics cards you can buy to fit comfortably inside. In fact, micro-ATX motherboard aside, you won't need to spare a thought for other small form factor components, as the

350D will happily house the rest of your PC's make up in standard trim.

There's ample room for a standard ATX PSU, a pair of hard drives, a pair of optical drives and enough space to jam in three SSDs, too. The meshed roof is large enough to fit a full 240mm water cooling radiator, such as Corsair's own H100i, and there's a hefty 140mm fan in the front of the case to help keep your graphics cards cool. The main part of the front panel is attached via a quick-release catch that allows unfettered access to the dust filter for the front fan. For someone with tech-obsessed cats at home, that's a godsend.

At \$130 it's not exactly a cheap case, so if you were thinking you might be saving some money opting for a mini machine, you'd be wrong. Typically though, Corsair is still making sure you get a well-designed and well-built case for your cash. When it comes to building, Corsair has included an access hole behind the board, so you can chop and change the CPU cooler without issue. There's space for simple cable routing to keep your build clutter-free as well.

Now that there's almost no compromise on the performance of miniature motherboards, there's a corresponding lack of compromise in builds, too. The Obsidian 350D will allow you to piece together a stylish, high-powered gaming rig with all the bells and whistles you could want.

Dave James

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CIDER**

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WITH OUR VERY OWN POP-UP BAR!**

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VODKA0.

BUILD A NEXT-GEN PC NOW!

With power consumption as high on the agenda as performance, Haswell is bringing change to desktop PC design. **Darren Yates** explains.

Not long ago, it was common to hear the question among serious PC gamers, 'which 1,000W power supply should I buy?', but much has changed in the last couple of years. As power charges have skyrocketed and smartphones and tablets have soared in popularity, all of a sudden everyone has a new-found interest in power consumption. GPU makers, particularly Nvidia, have been leading the way for some of that time, producing more power-efficient designs, and now Intel has launched its lower-power consumption CPU called Haswell.

Intel's fourth-generation Core i CPU family is no silver bullet for all-the-time low power draw, but we'll see some of its benefits start to permeate through into new compact desktop PCs later this year.

ULTRA-COMPACT DESIGN

Apple has shown us how compact desktop design is done over the last few years with its Mac Mini, which is built on the back of Intel tech. But over the last 12 months or so, Intel itself has been pushing ahead with its Next Unit of Computing (NUC) concept PC and word is we'll see Haswell versions appear later this year. No doubt it won't be the only option, but with lower-power CPUs available, combined with growing use of solid-state drives, integrated graphics and the decline of optical drives, for many PCs a large-size case is just no longer needed. Throw in growth in the compact ITX form factor market along with numerous new sub-50W TDP-rated Haswell chips hitting the streets and the words 'desktop' and 'tower case' may no longer have to be synonymous.

COST-EFFECTIVE ATX OPTIONS

Despite those changes, the value-for-money option will continue to be the standard ATX form factor and as with CPU generations past, the question of which motherboard you should consider will come front-and-centre. As usual, Haswell comes with a myriad of Lynx Point (Series-8) desktop chipsets to choose from. The Z87 Express will be the choice of hardcore gamers and buyers of Haswell-K processors, but for a cost-effective option that will still game just as well for notably less, the H87 Express is also one to keep in mind. Selling for around \$100 with six SATA 6Gbps ports, built-in RAID 0, 1, 5, 10 and even optional dual-card gaming, H87 boards might not be the sexiest choice, but it'll still suit most people's needs.

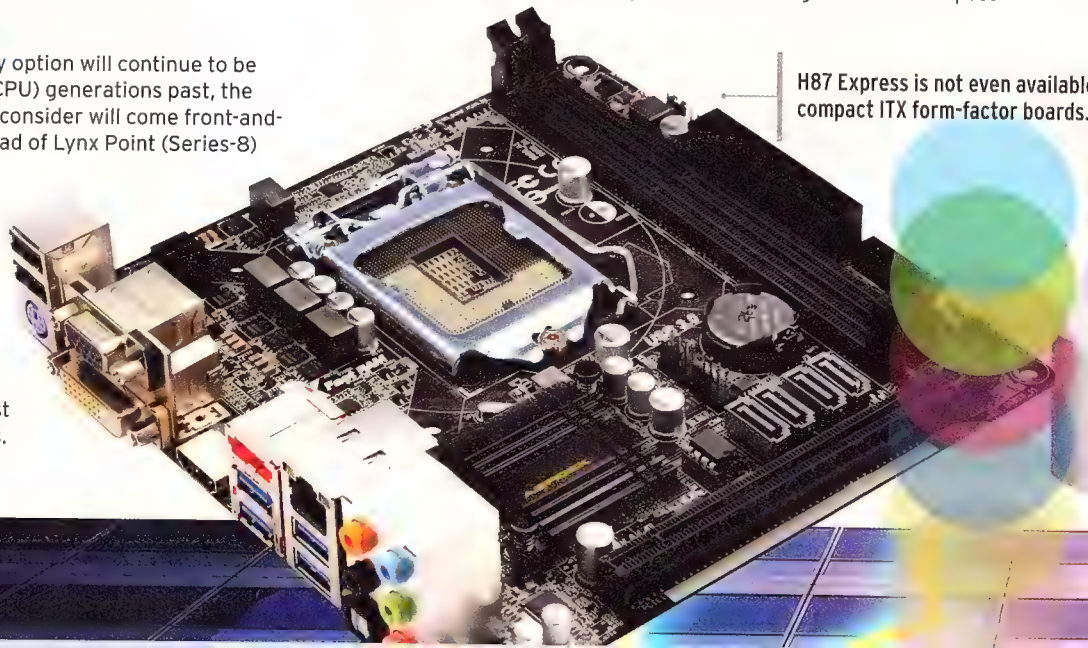
PSU REQUIREMENTS?

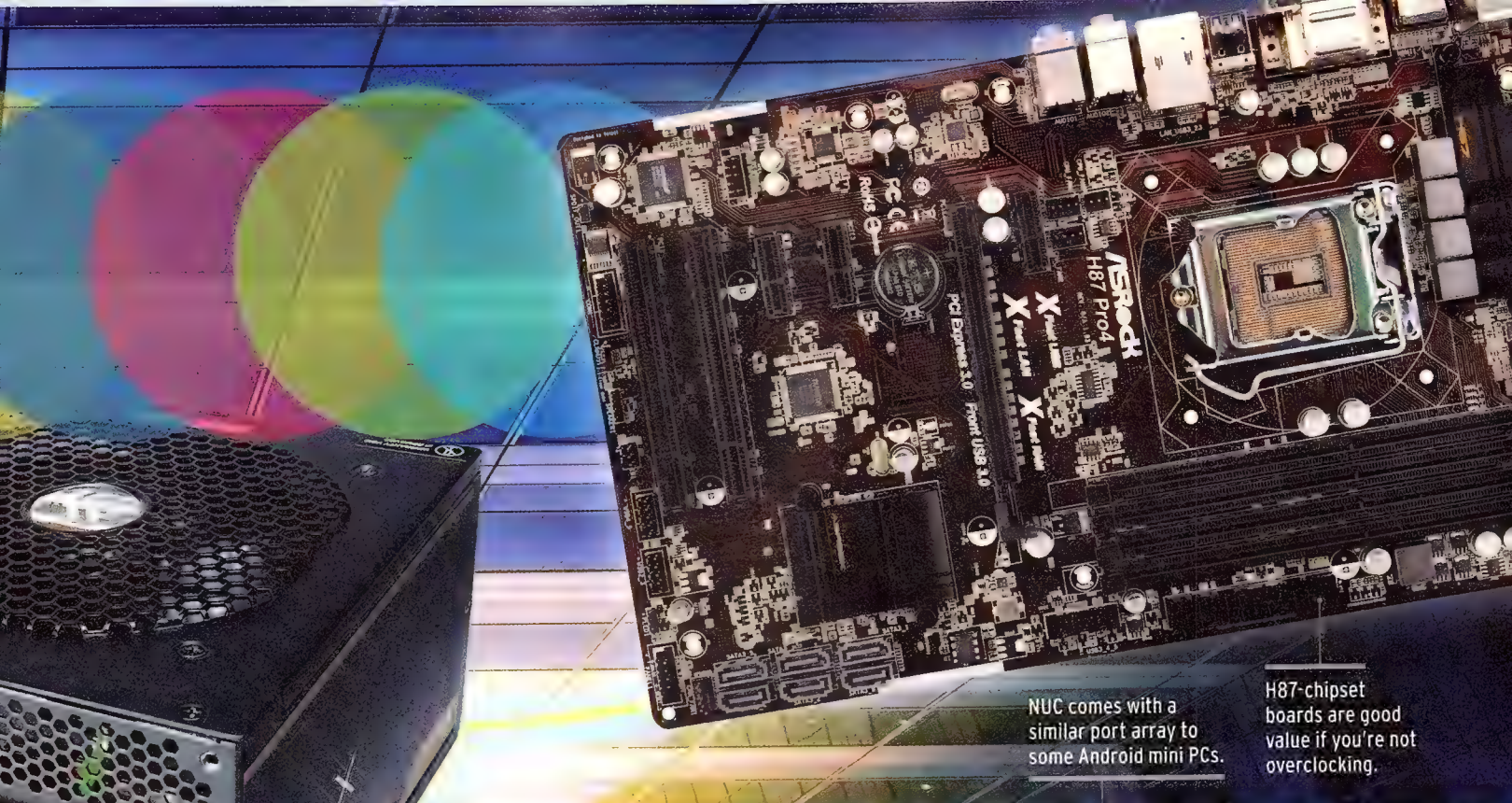
If there's one component that will be effected more than any other, it's the PC's PSU. One of the things we found impressive about the new Core i7-4770K CPU we tested last month was its low idle power consumption. At just 28.9W, you're well and truly down into notebook territory. So it raises the obvious question: do we need still need power ratings on the other side of 1,000W to power a decent gaming rig?

Based on last month's testing, the answer for most users will be a resounding 'no'. We had the Core i7-4770K teamed with a new GeForce GTX 770 card running games with Vsync off to push performance (and power draw) at 1,920 x 1,080-pixel (1080p) resolution. What we couldn't do was touch 300W in power consumption. The peak (maximum) power rate we saw was just 279W. Even if you took a conservative doubling of that as your required minimum PSU rating, that's just 550W. Nvidia says you'll want 600W for this GTX 770 card, but that'll be based on an Ivy Bridge or AMD system build. Interestingly, Nvidia rates the GTX 770 at 230W peak power, so even for two-way SLI, an 800W PSU is enough.

IS THE USB BUG A NON-ISSUE?

Before Intel launched Haswell and its Series-8 chipsets, engineers found an issue with some USB flash drives failing to relink when the system returned from a sleep state. The company decided it wasn't serious enough to halt the launch, but just serious enough to issue a chipset





Depending on your gaming needs, a 600W PSU might be more than enough.

NUC comes with a similar port array to some Android mini PCs.

H87-chipset boards are good value if you're not overclocking.

replacement known as the C2-stepping. At the time of our original pre-launch story we surmised that as Intel's published errata said new C2-stepping chipsets weren't expected until mid-July, motherboard manufacturers would launch new C2-branded boards. Our advice was based on not wanting to see our readers buy bug-affected boards, when waiting a couple of months would fix the issue. However, after recently speaking to a motherboard brand on the condition of anonymity, it's now clear we didn't have the full picture. In short, there will be no C2-branded motherboards, despite the fact that, yes, there'll be C1 and C2-stepping boards on the market – at least until all C1 boards are sold. So how will you tell the difference? Simple. You won't.

According to our source, C2-stepping chipsets were arriving as early as June, long before the 'mid-July' date we were led to believe. But when this brand did its own testing with these new C2 replacement chipsets, the USB 3.0/sleep issue was still there. What's more, apparently the problem also only effected Windows 8 builds. What left us jaw-dropped, however, was that our source also told us the problem has effectively been fixed – and on both C1 and C2 stepping boards. The solution? Apparently, all it took was a series of Windows 8 hotfixes from Microsoft in combination with new driver software from Intel.

The whole shemozzle raises at least two questions for us: if the USB 3.0/sleep issue could be fixed with software alone, why did Intel release a C2-stepping replacement? And if it doesn't fix the USB/sleep issue, what



Intel's NUC design is rewriting desktop PC design.

does C2 fix? We asked Intel Australia on June 18 to confirm that both C1- and C2-stepping chipsets are now problem-free when the software updates are applied and were told we'd receive a response the following day. We're still waiting. At time of publishing, our source told APC it was waiting to go public with the C1/C2 fix news, but couldn't because it was waiting for Intel.

So really, it's a bloody great mess. There's an unofficial fix that apparently works, but rumours that the official fix doesn't work at all. Is there an answer? Not until Intel makes an official statement, there isn't.

On the balance of what we now know, Series-8 boards are probably alright, but if you're running Win 8, make sure you install the very latest Intel chipset driver and grab all of the latest Win 8 hotfixes. Until Intel makes it official, you can't guarantee the problem is actually fixed.

GET PLANNING

Despite the Series-8 chipset mess, the lower power consumption of Haswell still makes this a good time to consider a system upgrade or a brand-new build. With power prices continuing to rise, anything that can reduce your power bills but not affect your computing enjoyment has to be a good thing.

Yep, it's a Mac but it's also been the most compact Intel desktop for years.



HASWELL'S NEW TRICKS

What tricks does Haswell have up its sleeve for delivering more performance? **Darren Yates** reveals the common and not-so-common options.

Back in the late-1990s when CPUs came as 'slot' cartridges bigger than an SSD, the processor everyone wanted was the original Celeron 300A. It was one of the first of Intel's budget range of CPUs, but had a unique gift we've not seen since – you could overclock that thing by a whopping 50%. Sure, increasing a CPU clock speed from 300 to 450MHz doesn't sound like much, but at the time it put the Celeron 300A into a league of its own. So much so, in fact, that they quickly sold out.

HASWELL OVERCLOCKING

These days, much of the mystique of overclocking has gone and, perhaps, a fair amount of the fun along with it. When Intel launched Sandy Bridge in 2011, it removed the bus clock separation between CPU/memory and the PCI bus. You could no longer increase the CPU front-side bus (FSB) independently of the expansion slots bus. Prior to Sandy Bridge, a locked CPU multiplier could be easily bypassed by increasing the FSB, which would overclock the CPU.

After Sandy Bridge, upping the FSB would have potentially disastrous effects on hard drives and PCIe bus-driven devices. However, there was a minor concession – the Turbo Boost frequency. Standard class CPUs (those without the K moniker) would allow you to get an extra 400MHz (about 10%) by increasing the top multiplier. But the word is that even this has now been removed from Haswell-class non-K chips. If you want any overclocking at all, you have to pay for the privilege and buy a premium-priced K-series processor.

Even when it comes to overclocking the Core i7-4770K option, it's not all beer and skittles. It's being commonly reported that Haswell doesn't overclock as well on air-cooling as Ivy Bridge. That said, last month

motherboard maker ASRock and overclocking guru Nick Shih did manage to slam a Core i7-4770K system up to 6.95GHz, so it's possible if you really bend your back.

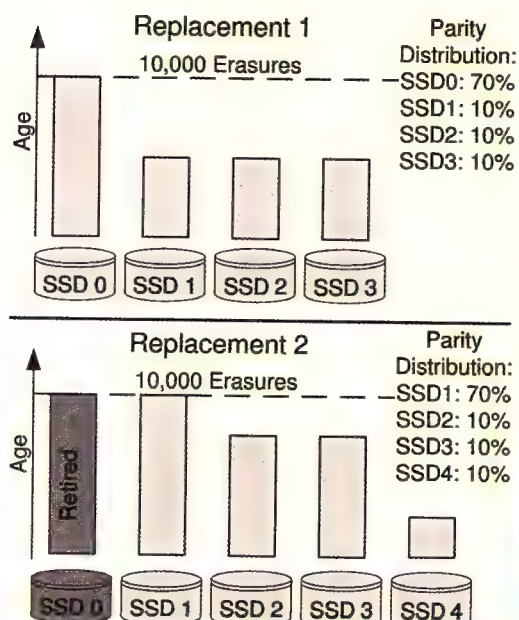
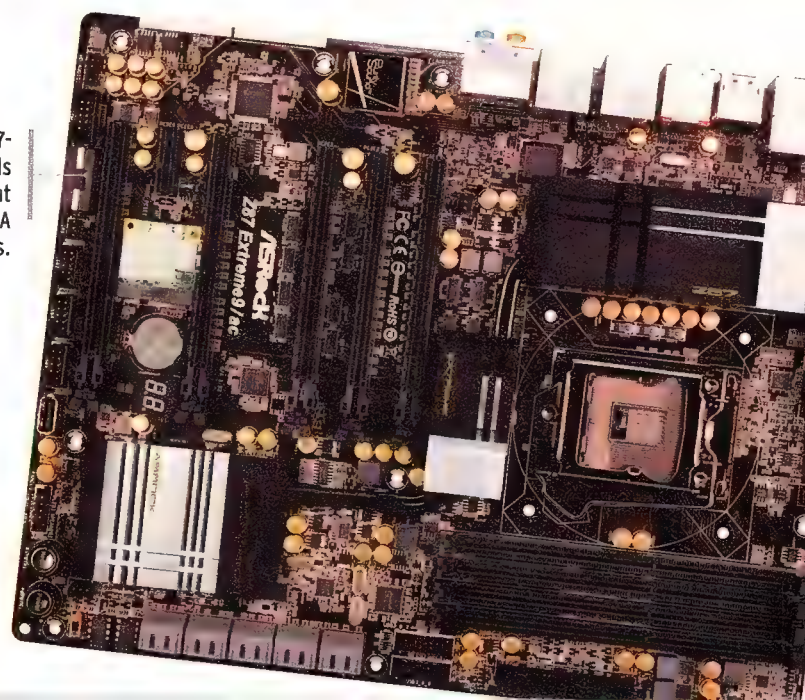
If you're wondering how far you can push your own Haswell chip, one tip doing the rounds is being attributed to motherboard maker ASUS. Take a Core i7-4770K chip, set its core voltage to 1.25V, lock its multiplier settings to 46 (creating a 4.6GHz clock rate) and if you can get it to boot, you have what's considered a '50th percentile chip'. It means at these settings, half of these chips should boot and half won't. If yours does boot, it may well overclock further – up as high as 4.8GHz at 1.25V has been recorded, but that's with some serious water cooling. The worst overclocking result recorded on a K-chip is said to be 4.3GHz, based on rumours attributed to internal testing by ASUS (see tinyurl.com/oksp7ea).

You can take these stats with a grain of salt but all the same, they'd be a reasonable starting point – just remember to go with a decent cooler like a Noctua's NH-D14 or similar.

RAID 0 SSD

Last month, we took an in-depth look at solid-state drive performance and how you can now RAID 0 them to gain over 1,000MB/second data rates using Intel's Series-7 H77 and Z77 chipsets. The good news is you can do the same thing with the Series-8 equivalents, the H87 and Z87.

You'll need at least Windows 7, a couple of choice (but identical) SSDs and version 12.0 of Intel's RST driver software. Intel's decision to ditch SATA II means that every ATX-style H87 and Z87 board should come with at least six SATA 6Gbps ports, but you'll find most high-end boards will go past that figure. If you want extreme, ASRock has reportedly gone nuts and produced a 'Z87 Extreme11/ac' motherboard with 22 drive slots – six SATA 6Gbps from Intel and another 16 SAS3 (Serial-attached SCSI) ports courtesy of a third-party chipset. The board was shown off at the recent Computex tradeshow, but there's no word on pricing or when it will become available. In the meantime, you'll find between eight and 10 SATA 6Gbps ports will be fairly common, mostly on Z87-chipset boards.



Differential RAID aims to work older drives harder to ensure better reliability.

Most Z87-chipset boards will feature at least eight SATA 6Gbps ports.



Intel's latest Core i7-4770K CPU can hit 6.95GHz – if you have a lab backing you.



SSD RAID ISSUES

With that many ports on offer, the temptation is to consider more complex RAID options using SSDs such as RAID 5. However, RAID 5 can be problematic for SSDs and the issues go way past whether TRIM is supported or not.

Back in 2010, Microsoft Research produced a white paper on RAID SSD reliability and found issues with both RAID 4 and 5. It proposed a solution called Differential RAID or 'Diff-RAID'. The idea sounds counter-intuitive, but it was to unevenly write parity data so that older drives took more of the work and newer drives less. This was so that the wear could be shifted so not all drives hit their reliability end-stop at the same time. You can read the white paper at tinyurl.com/plk8cl.

Recently, a new body of research carried out by the Chinese University of Hong Kong produced a mathematical model for both standard RAID and Diff-RAID and showed that while RAID 5 does produce added wear, Diff-RAID wasn't the silver bullet and in some cases, can be less reliable than RAID 5 (arxiv.org/pdf/1304.1863v1.pdf).

The problem revolves around the fact that error rates in SSDs increase as the drives deteriorate, whereas they are more constant in standard hard drives. The greater the rate of errors, generally the less reliable both RAID 5 and Diff-RAID become.

After reading the papers, you get a sense of how complex the issues have become. From our reading, if you're using straight RAID 5 in an SSD RAID setup, you may as well replace all of the drives as soon as the first one dies. It's a sure sign the other drives won't be long for this world either.

CHIPSET OPTIONS

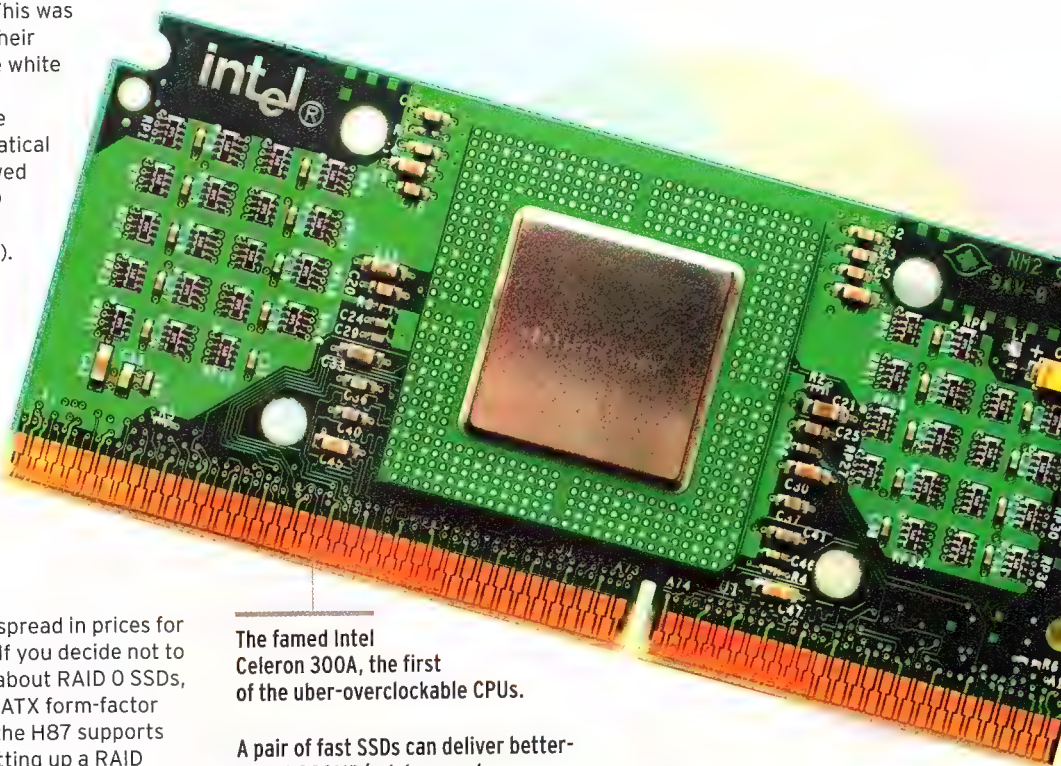
As with previous Intel generations, there'll be a huge spread in prices for Haswell motherboards, anywhere from \$90 to \$590. If you decide not to go down the overclocking road but still want to think about RAID 0 SSDs, consider a cheaper H87-chipset board instead. Every ATX form-factor H87 board should have six SATA 6Gbps ports and as the H87 supports RAID 0, 1, 5 and 10, you shouldn't have any trouble setting up a RAID array with SSDs.

Elsewhere, the H87 chipsets should deliver virtually identical performance levels compared with Z87 boards when used in standard single GPU, non-overclocked settings. Check Intel's Ark web site (tinyurl.com/ph3vrwp) for a side-by-side comparison and you'll see these two chipsets are identical. Getting two PCI-E graphics cards running at full PCI-E x16 bandwidth is when you'll need a top-drawer Z87 board.

CHOOSE CAREFULLY

The harder and faster we push technology, the more fragile it begins to look. Both SSDs and Haswell CPUs deliver exceptional levels of performance, but once you try to go beyond their standard performance levels with RAID or overclocking, respectively, things can begin to unravel fairly quickly. It seems we've now been saying the same thing for a few generations of Intel CPUs: the new release doesn't overclock as well as the previous version. It's clear that the more we pack into CPUs, the less

wriggle room there is in achieving above-and-beyond performance levels. The fact that MLC (multi-level cell) SSDs can have as little as 2,000 write cycles per cell means they need to be carefully managed to get decent life out of them, too. That's not to say you can't push PC technology to higher performance levels – not at all. But it is important to be aware that the closer we get to the pointy end of technology, the easier it is to break it off. We're a long way from the Celeron 300A now.



The famed Intel Celeron 300A, the first of the uber-overclockable CPUs.

A pair of fast SSDs can deliver better-than-1,000MB/s data speeds.



THE PC OF THE FUTURE

The PC platform is continually evolving. Darren Yates reveals the big changes that are coming over the next couple of years.

By virtue of its modular design, the PC platform has to have inherent stability, otherwise component compatibility would be non-existent. That doesn't mean the PC doesn't change – at some levels, change happens at a glacial pace; at others, the pace can seem a bit overwhelming. But for the most part, change is usually aimed at delivering faster performance and despite the relative stability we've had over the last few years, there is more change on the way.

PCIe SSDS

Solid-state drives are the hottest new component to arrive on the PC market for years, offering upwards of four and five times the read and write transfer speeds of traditional platter-based drives through the same SATA 6Gbps ports. But even SATA-connected SSDs are starting to lose their shine in the never-ending quest for greater data transfer rates. In last month's issue, we showed you how you can use Intel's recent Rapid Storage Technology improvements to RAID 0 SSD drives to push them through the 1GB/s transfer speed barrier. But while SATA 6Gbps controllers can deliver much more than that, there's an alternative option that's delivering the RAID 0 speeds of storage straight to the PCIe bus.

They're called PCIe SSDs and it's a market expected to grow considerably over the next few years. Samsung recently released its first PCIe SSD designed for ultrabooks, the XP941, with a claimed sequential read speed of 1.4GB/s – close to three times what most SATA 6Gbps models achieve. With capacities of 128, 256 and 512GB, the drive conforms to the tiny new M.2 standard (designed specifically for ultrabook laptops) and it weighs just 6g. It's more than likely we'll see

them in the new Samsung ATIV ultrabooks and possibly a MacBook Air or two. They'll help achieve near-instant cold-boot times over the next year.

PCIe SSDs themselves aren't new – they've been around on the desktop for the last few years – and their main appeal is that they can bypass SATA bottlenecks and get right to the PCIe bus via a PCIe(x1) expansion card. That's what allows them to achieve these higher speeds. They also bypass the problem of motherboards requiring the latest SATA controllers – as long as you have a spare PCIe slot, you can plug one of these in and gain maximum performance straight away.

Brands like OCZ are already obtaining speeds of up to 1.5GB/second with their RevoDrive 3 X2. But so far, PCIe SSDs have been an expensive way to achieve those speeds – and that's partially because an agreed standard for interfacing SSDs with PCIe has been a while in the making and manufacturers have to build their own controllers to make it happen. But now with NVM Express as the standard and with Samsung now mass producing PCIe SSDs for various ultrabooks, the cost of the technology should begin to fall. Despite the cost, long term, the PCIe bus represents a largely untapped source for high-speed storage bandwidth.

DDR4 RAM

This will likely cause a collective groan amongst PC builders, but the beginning of next year will bring a new DRAM standard – DDR4. The final DDR4 specification was published in September 2012 and it's been talked about since early 2011, but with continued gloom in the PC industry, there's been little urgency amongst manufacturers to release it. Part of the reason is that no-one's clamouring for it; another is DDR3 prices

rising, due to a lack of supply as some makers exit the market. In practice, it'll take Intel and AMD to launch chipset support before RAM makers start to get serious about it. As for that, the next-generation of Intel enthusiast CPUs are known as 'Haswell-E' and will act as a replacement for the current Intel LGA2011 platform. They'll likely be the first place you'll see as a home for DDR4 when it arrives sometime early next year.

As a prelude, some brands such as Crucial and Micron have already begun promoting their DDR4 chops.

While DDR3 typically operates at 1.5VDC, the new 284-pin DDR4 module uses a lower 1.2VDC voltage and will likely be manufactured at 28nm by the time it hits the market next year. The combination of lower voltage and a smaller manufacturing scale will result in roughly 20-40% lower power consumption and reduce the need for huge heat spreaders (unless of course, you start overclocking the stuff).

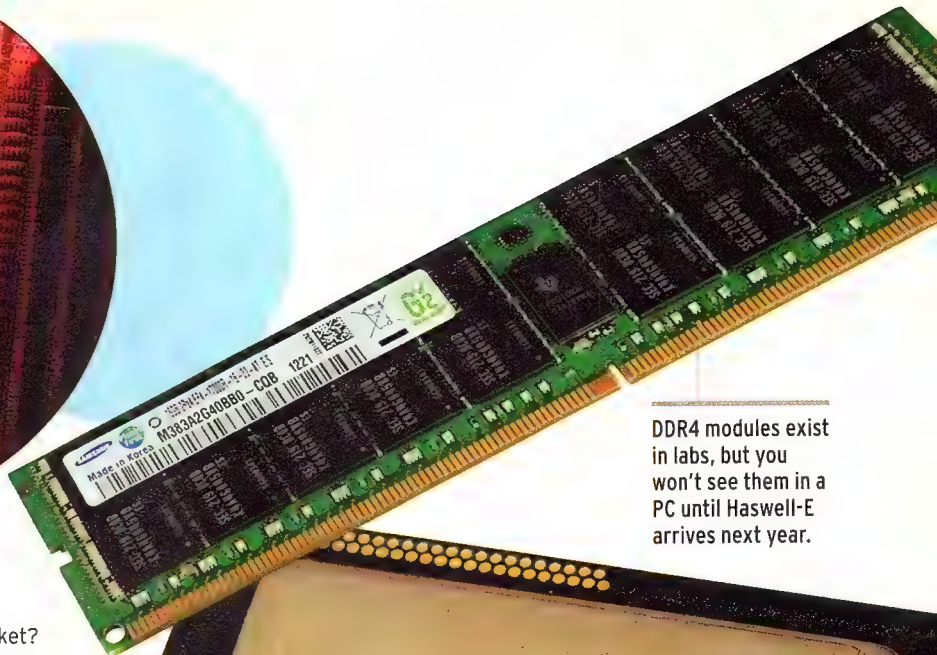
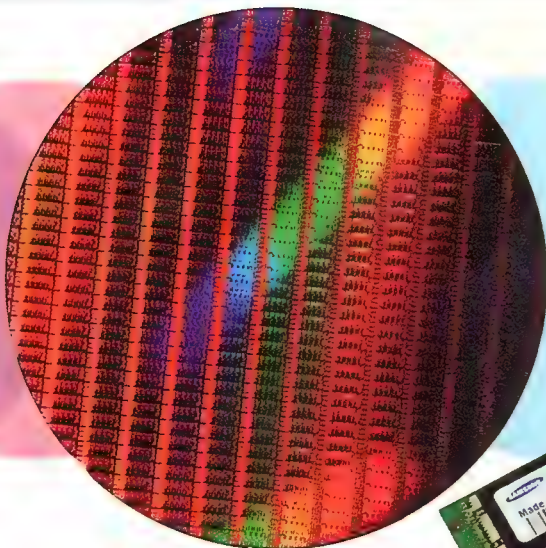
DDR4 DIMM speeds will start at 2,133MHz, doubling the data throughput rate of base-level DDR3, and the word is you can expect extreme-grade modules to clock up to 3,200MHz. You'll also see higher-capacity DIMMs, packing in as much as 16GB per module, or up to 64GB of RAM on a motherboard with four RAM slots. (Make a RAM drive out of this stuff and you'll leave even SSDs for dead.)



Samsung's XP941 is a new 1.5GB/s PCIe SSD for ultrabooks.

PCI EXPRESS 4.0?

The PCI-SIG consortium began development on next-generation PCI Express 4.0 back at the end of 2011, announcing it would deliver twice the bandwidth of PCIe 3.0. But with PCIe 3.0 graphics cards only just beginning to arrive online, don't expect PCIe 4.0 to arrive any time soon. According to PCI-SIG, the final specification isn't expected until the '2014-2015 timeframe'.



DDR4 modules exist in labs, but you won't see them in a PC until Haswell-E arrives next year.

The question is: when will DDR4 make it to the mainstream market? At this stage, it could be Broadwell (Haswell's successor), but it's more likely to be on the follow-up to Broadwell, called Skylake. With first usage of DDR4 not expected until early 2014, it seems too early for Intel to risk it in mainstream markets when demand is still fairly weak.

NO MORE CPU SOCKETS?

There was a bit of a flap late last year when rumours began spreading that Intel would ditch the CPU socket when it released Haswell's successor, Broadwell, in 2014. Those rumours died as quickly as they rose, but it was interesting that Intel did indeed launch a series of BGA-only R-class desktop chips as part of its Haswell family launch. BGA (Ball Grid Array) chips are used in pre-soldered applications.

However, if the desktop PC market continues to sell, we can't see Intel ditching the CPU socket any time soon – and here's why. Looking at the R-class Haswell chips, they're all noticeably lower-TDP parts, with nothing over 65W. The sort of physical pressure Intel needs on its top-drawer CPUs with the heatsink-fan combo would also be difficult to reliably achieve with a soldered-only chip.

Had Intel pushed out LGA1155 for another run this year with Haswell, ditching the socket next year might've been more likely. But it's unlikely it would put engineering effort into a socket it'd only use once. Of course, we could be wrong, but we certainly hope we're not!

R-class Haswell chips will likely get use in all-in-one and concept PC designs, but unless Intel can work a minor miracle and get 4770K-grade CPUs into a 65W TDP – highly unlikely at this stage – the CPU socket will have to remain. Well, at least as long as there is a PC enthusiast gaming or performance computing market to demand it.



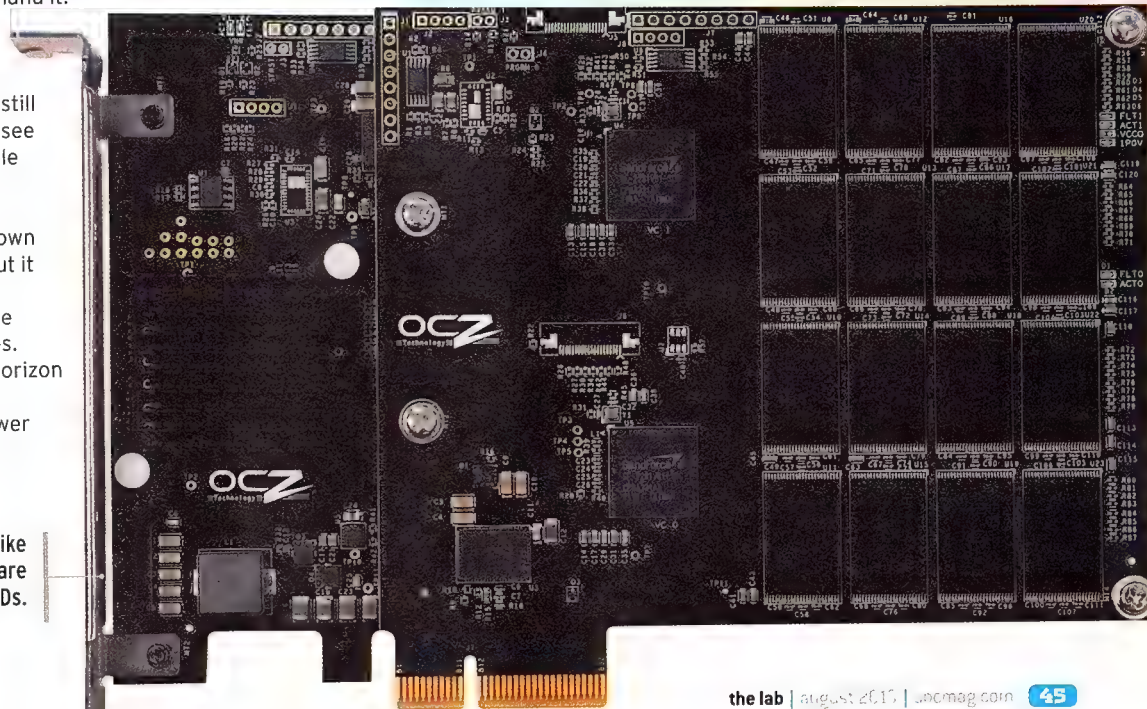
Intel's new LGA1150 socket is unlikely to disappear soon.

THE PIONEERING PC

While the world might be going nuts over tablets and smartphones, it's the PC that still pioneers much of the new technology we see today. The DDR3 memory in those portable devices now, for example, started life in desktop and notebook PCs. Eventually, low-power versions of DDR4 will trickle down into at least the Windows-class tablets, but it will start with the enthusiast desktop and server PCs. Who knows – we may even see PCIe SSDs come to those personal devices.

The reality is there is nothing on the horizon that will come close to beating the PC in delivering maximum computing horsepower for the lowest dollar value.

Current PCIe SSDs like OCZ's RevoDrive 3 are faster than RAID 0 SSDs.



BUILD A KILLER HASWELL PC

Looking for a good-value Haswell desktop PC build? [Darren Yates](#) shows you how to put together two systems for completely different applications.

With Haswell fresh off the production line, this month we've put together a special Master Builder column that'll show you how to put together two systems built around Intel's new fourth-generation Core processor family. While there are many different ways to build a desktop PC, there's one feature any system build must offer – and that's value. So, we've gone for two quite disparate builds – a compact, budget-focused ITX system and a full-sized ATX performance gaming PC.

WHAT WE'RE LOOKING FOR

The key feature we're aiming for with each build is room to grow. Your needs may change over time, so making your initial expenditure cover as much ground as possible should always be a key priority.

Even though we're dealing with brand-new tech, the process for designing a Haswell PC is the same as building an Ivy Bridge or Sandy Bridge box – you want to push your cash towards components that matter most and save money on what we call 'hero' components. Hopefully you'll see that as we go through these builds. The key to our ITX system is the case. The BitFenix Prodigy isn't quite the smallest ITX box you can buy, but it's stylish, has plenty of room for growth and comes with a price that won't hurt. You can double the PSU capacity here, even add a decent graphics card

This SanDisk Extreme SSD delivers speed on a budget.

later and still keep everything inside this relatively petite box.

Our gaming system has a similar goal, but here, the key is what we call 'smart performance': high-speed components that don't require a nose-bleed budget. Gigabyte's GA-Z87X-D3H motherboard is the key component here. It's just on the right side of \$200, but offers both SLI and CrossFire dual-card gaming – that gives you maximum versatility to choose how, what and when you upgrade to dual-card gaming. Sure, we could've spent \$400 on a motherboard but with that extra money, we've been able to incorporate SSD/HDD storage instead and lost no important gaming functionality.

CUTTING THE RIGHT CORNERS

What we've done with these builds is included enough PSU capacity to run the systems as they're currently stacked. But if you decide to add a second card to the gaming rig or a dedicated graphics card to the ITX build, you'll need to expand the PSU capacity – about 800W for the gaming box and around 600W for the ITX system.

The reason for doing this is you don't pay for PSU capacity you don't need, but if you do need it later, upgrading the PSU won't require a new motherboard or reinstalling the OS. PSU standards haven't changed significantly, so compatibility shouldn't be an issue.

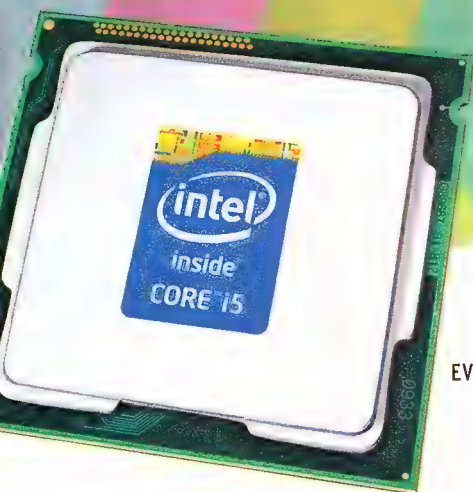
The only thing you need to be careful of is making sure the depth of your new



Corsair's 200R Carbide case is roomy without being expensive.

HASWELL PC SPECS AND PRICES

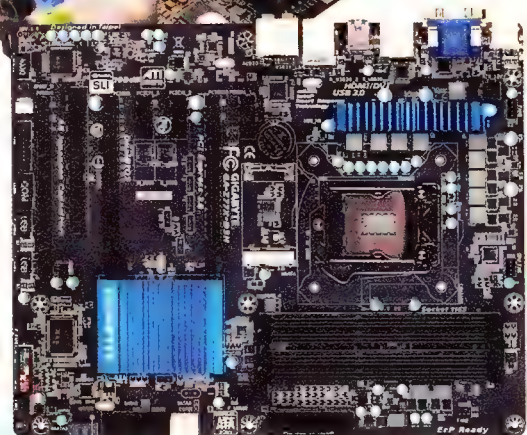
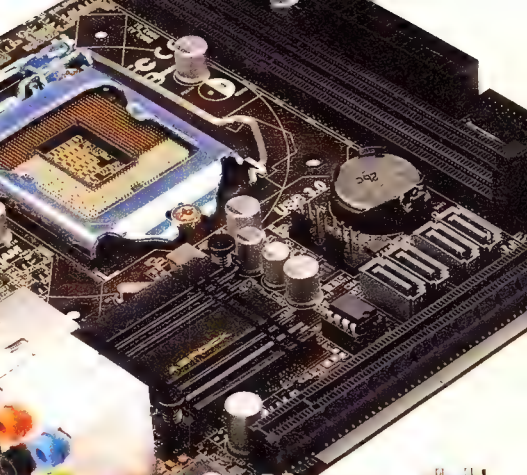
	Build #1 – Mini-ITX PC	Cost	Build #2 – Gaming PC	Cost
CPU	Intel Core i5-4430	\$208	Intel Core i5-4670K	\$269
CPU cooler	Supplied cooler	\$0	Cooler Master Hyper 212 EVO	\$35
Motherboard	ASRock B85M-ITX	\$99	Gigabyte GA-Z87X-D3H	\$199
RAM	8GB DDR3-1333 (eg. Kingston ValueRAM)	\$63	16GB DDR3-1600 (eg. Corsair Vengeance C9)	\$165
Graphics cards	Use integrated graphics	\$0	Gigabyte GeForce GTX 770 OC Edition	\$529
Storage – SSD	120GB SanDisk Extreme SSD	\$112	240GB SanDisk Extreme SSD	\$204
Storage – HDD	1TB Western Digital WD10EZEX (Blue)	\$68	2TB Western Digital WD2002FAEX (Black)	\$165
Operating system	Microsoft Windows 8 (64-bit)	\$99	Microsoft Windows 8 Pro (64-bit)	\$149
Case	BitFenix Prodigy	\$89	Corsair 200R Carbide	\$75
PSU	Antec VP350P (Delta) 350W PSU	\$43	Antec VP-650P (Delta) 650W PSU	\$82
	Total cost	\$781	Total cost	\$1,872



The Intel Core i5 CPU series does nicely for our two builds here.

ASRock's B85M-ITX is a compact board that still offers the capacity for discrete gaming.

Cooler Master's Hyper 212 EVO is a good budget performer.



CrossFire and SLI gaming make this the best gaming board under \$200.

PSU for the ITX build is no more than 150mm or else it may not fit. That said, there are plenty of 600/650W PSUs with a 140mm case depth so it shouldn't be a problem.

THE MINI-ITX BUILD

While Intel will release its dual-core Core i3 CPUs shortly, for this build we'd suggest the Core i5-4430. It's the cheapest quad-core chip available and for our money it's the right spot to start, even if you're working with a tight budget. And by using the chip's HD 4400 integrated graphics engine, we save by not having to include a discrete graphics card. As for the motherboard, ASRock's \$99 B85M-ITX is the cheapest Series-8 ITX board on the market, but still comes with a PCI-E x16 slot in case you want to add a graphics card later.

SanDisk's 120GB Extreme SSD is getting a bit long in the tooth, but it's nicely priced and just big enough to use as a boot disk. Thankfully, hard drives are dirt-cheap and we've incorporated Western Digital's 1TB Blue WD10EZEX to give you bulk storage.

The BitFenix Prodigy is a great looking ITX style case for around \$80 all up, but it's modular enough to give you room to grow.

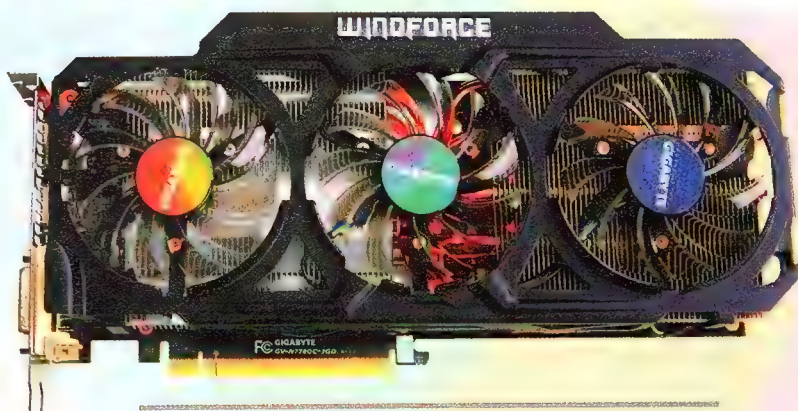
We've gone for a small Antec VP350P 350W power supply here. That's basically because as the system stands, you just don't need more – not until you decide to throw in a discrete graphics card. The VP350P is manufactured by Delta Electronics, so it should be a good and reliable unit. If you decide to add a graphics card, you'll need to replace it with something around the 600W mark. Just be careful with the replacement PSU's physical size – the Prodigy case can handle PSUs with a 150mm depth, but more than that and you'll have problems getting it to fit. That said, there are plenty of 600W PSUs with 140mm physical depth, so you shouldn't have any trouble finding a good one.

THE GAMING PC BUILD

Intel's unlocked Core i5-4670K quad-core CPU is only about 10-15% slower than the top-drawer Core i7-4770K, but it's around 40% cheaper and on a gaming PC, where most of the work is done by the graphics card, it's highly unlikely you'll notice the difference.

Gigabyte's GA-Z77X-D3H costs under \$150 if you shop around online, and it's the cheapest board to offer both CrossFire and SLI dual-card gaming giving you maximum flexibility for the lowest cost.

We've also thrown in Gigabyte's GeForce GTX 770 OC card to give you plenty of gaming speed, which you can near-on double if you later decide to add in a second. SanDisk's 240GB Extreme gets a run here as the OS drive and we've included Western Digital's 2TB Black drive to give you fast, reliable storage.



The Gigabyte GTX 770 OC graphics card delivers excellent speed.

With a five-year warranty, you're not going to go wrong with this one.

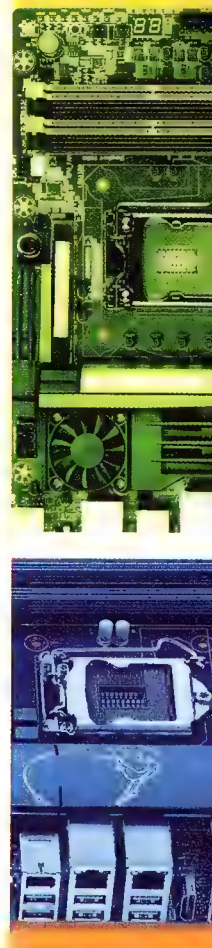
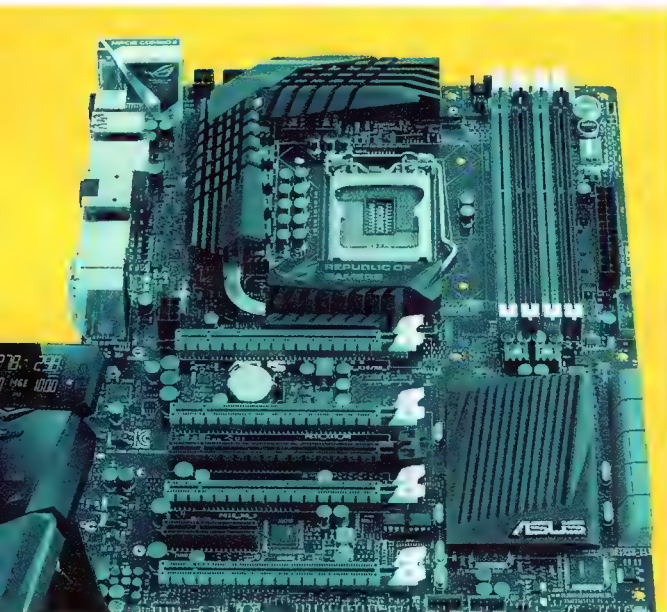
For the chassis, we've chosen Corsair's 200R Carbide case for its clean, stylish design and truckloads of space. It's also surprisingly well-priced at just \$75 on the street and it should have no trouble handling two GTX 770 cards. A good PSU is critical in a gaming PC and we've gone for Antec's 650W VP-650P, another Delta Electronics-made unit. It'll be fine for a single-card build, but if you decide to go SLI, you'll need to replace it with something around the 800W mark to have enough headroom to keep everything happy.

CUSTOMISE YOUR OWN DESIGN

These are just two ways you can build these particular systems. There are multiple choices in each component category, so if you can't find or don't like one of the components we've selected, you can almost always find something else that may better suit you or your budget.

That said, there's enough horsepower in both of these systems to last at least a couple of years. And if Intel keeps the LGA1150 socket for a bit, you might even get these systems running a Broadwell CPU sometime in 2014.





Z87 BOARDS PUT TO THE TEST

If you've got the upgrade itch, [Bennett Ring's](#) got your fix: eight glitzy new Intel motherboards.

Unlike AMD, Intel has very little regard for the past. This company doesn't care that tens of millions of customers are happily running Series 7 motherboards barely a year old, released in early 2012 alongside the third-generation Core CPU. With the launch of this year's fourth-generation Core CPU, aka Haswell, Intel is wiping the chipset slate clean all over again. Alongside Haswell arrives a brand new CPU socket, Socket 1150, running on a brand new motherboard chipset, the Series 8. As usual, Intel has enforced zero backwards compatibility; if you want fourth-generation Core, you must buy a new motherboard (and you can bugger off if you don't like it).

Normally we don't mind Intel's forced chipset upgrades as they're accompanied by a swathe of killer features that take the sting out of the upgrade pain. While the Series 8 chipset does bring a host of new elements, many of those are just more of what we had before. After playing with several motherboards based on this chipset, it's apparent that desktop users will see very little difference between what Z77 offered and what we have now, with the major differences squirrelled away inside the CPU core.

This is because Haswell wasn't primarily designed for desktops. Instead, this CPU focused first and foremost on mobility, where scalable power saving was the ultimate goal. As a result, Intel has moved the Voltage Regulator Module (VRM) off the motherboard and into the CPU, allowing Haswell much finer control over system power. It's fantastic news for laptop users, but requires an entirely new motherboard chipset, which has in a sense been foisted onto desktop users who are forced to adopt these mobile-centric features even if they don't need them. It also supports much deeper sleep and wake features, perfect for ultrabook users who need to keep the CPU idling when not in use, but once again arguably not quite as essential for those of us chained to a desk.

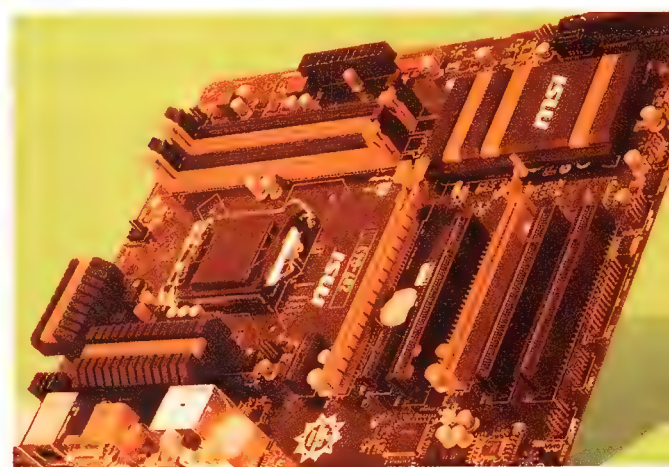
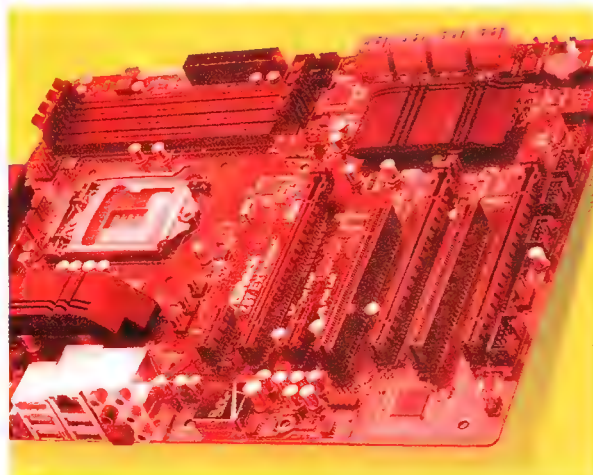
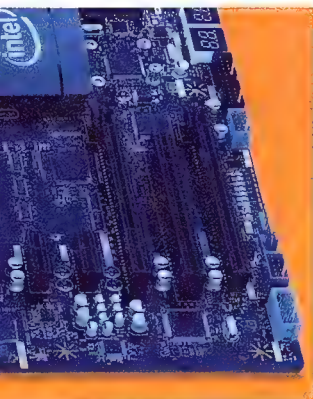
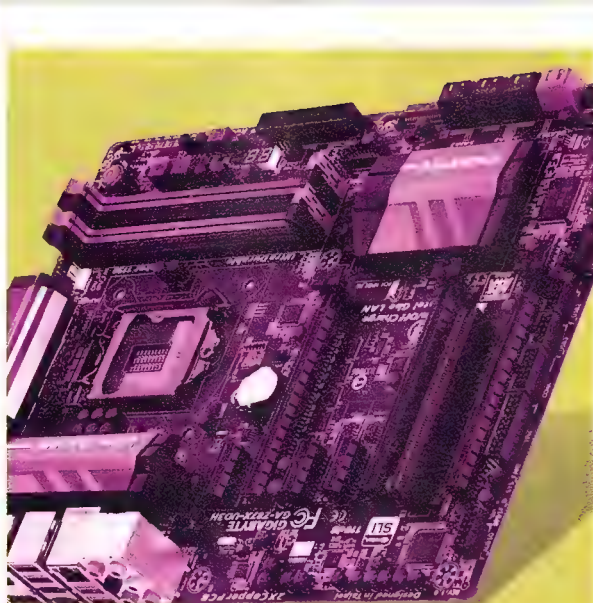
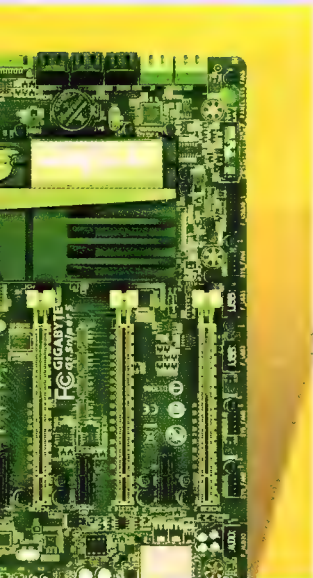
This article concerns itself with the performance king of the new

Series 8 product line, the Z87 chipset. Intended for power users, gamers and overclockers, this variant is supposedly stuffed to the gills with all of the best goodies. Yet when it comes to Intel's own additions, there are arguably only two real benefits that most users will notice. First is the move to SATA 6Gbps throughout, with the Z87 including six of these ports. Considering most prior motherboards already had this many SATA 6Gbps ports courtesy of third-party SATA controllers, it's not that big a deal. The other addition is the increase in USB 3.0 ports, up from two in the last generation to six in the Z87. That should be enough to sate most user's needs for high-speed ports – at least for the next year or two.

Extreme power users have a couple of other handy additions, though they're ones that many of us will never notice. The 16 PCIe 3.0 lanes are now run directly from the CPU, which can host up to three graphics cards in triple SLI/CrossFire modes. Tweakers will also be able to utilise much more granular overclocking controls than the prior generation, allowing faster memory speeds when the CPU is overclocked. Note that the Z87 is a must if you want to overclock one of the new K-series CPUs, even if you just stick with basic multiplier adjustments.

Other than that, any new features have had to come directly from board makers themselves. To be frank, neither the extra USB 3.0 or SATA 6Gbps ports is reason enough to splash out the \$250 or more necessary for a new motherboard if you're running anything from the Ivy Bridge generation. Factor in the fact that Haswell is barely 10% faster than Ivy Bridge in pure CPU duties and the fourth-gen Core with accompanying Series 8 chipset is perhaps a tad underwhelming for desktop users who are serial upgraders.

There is an exception to this rule, though. If your CPU is older than second-gen Core (aka Sandy Bridge), you'll notice rather substantial performance increases, in the order of 30% or more. That makes Haswell a fairly decent proposition for those upgrading from older systems.



ASRock Z87 Extreme4

Feature-rich but performance-poor.

@ www.asrock.com

✓ Very affordable, well-rounded specs, solid onboard audio.

✗ Lacklustre performance.

\$168

7/10



HDMI INPUT

XFAST 555
BOOSTS LAN AND
USB SPEEDS

UEFI MOUSE/
KEYBOARD BIOS

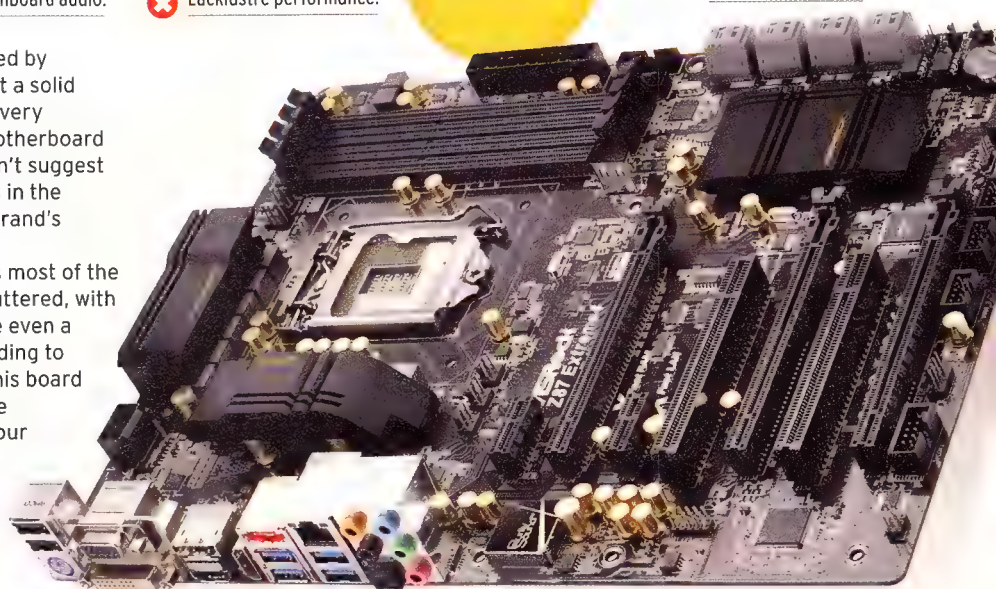
ASRock is the quiet achiever of the motherboard world. Loved by cash-strapped PC enthusiasts, its products have quickly built a solid reputation for delivering most of the big ticket features at a very competitive price. It's no wonder they're the third largest motherboard manufacturer in the world, though its Aussie exposure doesn't suggest such popularity. With one of the most competitive price tags in the roundup, at just \$168, can the Z87 Extreme4 live up to the brand's utmost potential?

In a word, yes. This is a fully featured board that includes most of the gizmos that power users need. The layout is clean and uncluttered, with triple PCIe 3.0 x16 slots and twin PCIe 2.0 x1 slots. There are even a couple of old PCI slots, though we highly recommend upgrading to PCIe if you haven't already. To our surprise, ASRock rates this board as capable of quad CrossFire and SLI, making it arguably the cheapest platform for those with four graphics cards. The four DDR3 slots are rated to handle speeds of up to 2,933MHz, one of the few strengths of the Z87 chipset. On top of the six Intel SATA 6Gbps ports are another couple provided by an ASMedia controller, along with a single eSATA port. The six Intel USB 3.0 ports are supplemented by another four, also powered by an ASMedia controller, for 10 in total.

Gamers will appreciate the enhanced onboard audio, which uses Realtek's latest ALC1150 codec, but surrounds it with premium amplifiers and EMF shielding. Audio quality was definitely better than most onboard solutions, but still not quite up there with a dedicated solution.

Unfortunately, these excellent specs are let down by some rather

lacklustre benchmark results, with the Z87 Extreme4 one of the slowest boards we've tested. If ASRock can release a new BIOS that resolves these issues it will have a winner on its hands, but until then the performance sacrifice is hard to swallow.



ASUS Maximus VI Extreme

When money is no obstacle.

@ www.asus.com.au

✓ Built for overclocking, PLX chip increases PCIe 3.0 bandwidth, OC panel is handy.

✗ Look at the price, overkill for non-tweakers.

Welcome to one of ASUS's flagship products for the new Z87 chipset. Sold under the company's exclusive Republic of Gamer brand, it's actually not intended solely for gaming; the expensive features on this board are aimed at the competitive overclocking audience. These guys spend most of their pay on their beloved hobby, which is why ASUS can get away with such a stratospheric price point. Let's see what half a grand buys us.

The key feature of this board is the small breakout board, known as the OC Panel. This is designed to move the switches and gates overclockers use to monitor voltages and other assorted weirdness off the motherboard, and onto an easy-to-reach centralised position. For most of us it's absolutely useless; for extreme overclockers it's potentially a godsend. The Extreme Engine Digi+ power delivery uses an 8+2 phase design to deliver the cleanest voltages, and it's no wonder that this board took out 10 of the 11 awards at Corsair's recent Computex 2013 overclocking event.

As well as a plethora of PCIe 3.0 ports – all running at faster speeds thanks to the inclusion of a PLX chip, which delivers extra PCIe 3.0 bandwidth than the default – a mPCIe Combo card plugs into a small header on the board, adding 802.11ac Wi-Fi, Bluetooth 4.0 and M.2 SSD support. The only thing lacking is the onboard audio, which uses the generic Realtek solution. ASUS has made a fuss about the software



9
10

\$499

i UEFI BIOS WITH CUSTOM ASUS INTERFACE
4-WAY SLI/CROSSFIRE
DDR3-3000MHZ
OVER 4 SLOTS

included, but it's mostly garbage. The SSD eraser can easily be found online for free, RAM drives offer zero performance increase for most games and the Sonic Radar is basically a cheat for first-person shooters.

Ignore the crappy software suite and we're left with an incredibly potent overclocking platform. Sure, most of the features are utterly irrelevant for most of us, but if you need a board to go with your tank of LN₂, this bad boy is the one for you.

ASUS Maximus VI Hero

Do we need another Hero?

@ www.asus.com.au

✓ Justifiable price, good onboard audio, excellent performance.

✗ Uses Realtek for audio, no PCI slots.

Gamers love ASUS's Republic of Gamers products, but they're not quite so endeared to this range's extreme pricing. ASUS has finally realised that most of these products are out of the range of mere mortals, so it's delivered the Hero, aiming to include most of the killer features at a price that won't slay your wallet. Let's see how many compromises had to be made to keep the price down.

It's still not the world's most affordable board at almost \$300. However, you get a lot of goodies for the price, starting with a very high-quality onboard audio solution. Labelled SupremeFX, yet again we see the Realtek's ALC1150 tucked away beneath the EMF shield, but ASUS has spent a chunk of coin making it sound as good as possible, using premium components to deliver audio well above the norm.

Then there's the same Extreme Engine Digi+ III power solution, as found on the vastly more expensive Maximus VI, ensuring the Hero will overclock to hell and back. Untapping the potential of the K-series is a breeze thanks to the intuitive graphical BIOS, but there are a few sections packed with new terms we've never heard of.

The biggest cut to the Hero is the range of expansion ports. There's the usual three PCIe 3.0 x16 slots, but just three PCIe 2.0 x1 slots fill out the rest of the board. There's also no breakout box in the form of the OC Panel, though ASUS intends this Hero board to be more for gamers than serious tweakers. And gamers will love the performance,



8
10

\$295

i SSD ERASE, RAM DISK AND SONIC RADAR SOFTWARE
SUPREMEFX
ONBOARD AUDIO
8 X SATA 6GBPS AND
6 X USB 3.0 PORTS

with the Hero easily matching pace with the fastest boards in our benchmark tests. We're left with a board that has everything a gamer needs, including fast frame rates, at a price that isn't insane. It'll be even better value in a few months, when the initial launch price drops a little.

Gigabyte G1.Sniper 5

When money is *really* no obstacle.

@ www.gigabyte.com.au

✓ The best onboard audio, stacks of connectivity options, advanced power supply.

✗ No 802.11ac, inconsistent performance results.

8
10



\$539

i FOUR PCIe x16 SLOTS AND THREE PCIe x1 SLOTS WITH PLX
TWIN 1GBIT LAN ADAPTORS
10 X USB 3.0 AND 10 X SATA 6GBPS PORTS

If you're considering this motherboard, you're probably doing it from the back of your private jet. Motherboards do not get any more expensive than this, but they also don't come with more tech stuffed into the box.

One of the trends we've noticed with Z87 boards is an increased focus on onboard audio, and the G1.Sniper 5 takes this to entirely new levels. Powered by the excellent Creative Sound Core3D codec, Gigabyte has equipped this board with removable audio amplifiers. You can buy one from your favourite amp manufacturer and insert it within seconds, tailoring the sound to your specific tastes. We tested this with a Burr Brown amp and were blown away by the audio quality; this is truly as good as a dedicated sound card, especially when it comes to headphone use. Unfortunately, the amp doesn't work when using surround speakers, but the audio quality remains exceptional regardless.

As well as the usual four-way GPU support delivered by the PLX chipset (the norm at this price range), the G1.Sniper 5 includes special water blocks for cooling the CPU socket's components. It can also run in air mode, with a small dedicated fan. Qualcomm Atheros Killer E2200 networking is included, which uses clever QoS to ensure your games always come first when prioritising online traffic. Finally, an add-in card delivers 802.11 a/b/g/n (but sadly no ac), as well as Bluetooth 4.0.

Our performance numbers were a little surprising, however, with the board scoring a dismal result in PCMark 8, yet heading towards the front of the pack in our gaming tests. We think it might have to do with the average memory results – an area Gigabyte is constantly focusing on for improvement via BIOS updates.



Gigabyte Z87X-UD3H

Trims the fat to offer a solid but slightly boring board.

@ www.gigabyte.com.au

✓ Affordable, lots of video output options, solid performance.

✗ Average and sometimes scratchy onboard audio.

8
10

\$229



i DDR3 UP TO 3000MHZ
CLEAR CMOS BUTTON
NEW APP CENTRE SOFTWARE SUITE

Sometimes you just want a motherboard for an all-purpose PC, and this is the intended audience for the Gigabyte Z87X-UD3H. It's well-rounded and affordable, yet lacks the flash of some of the specialised models offered at much higher price points.

Like all of Gigabyte's mid-range and above products, this board uses the special PowIRstage ICs to deliver power. These replace the MOSFETs and capacitors used on other brands, delivering lower power usage and cooler operating temperatures; we're surprised nobody else has started using them in the 12 months since Gigabyte revealed them.

As far as connectivity options go, the Z87X-UD3H has a bit of everything. Three PCIe x16 slots sit alongside a similar number of PCIe x1 slots, with a single PCI slot for that old Sound Blaster you don't want to part ways with. Given the rather average onboard audio of this motherboard, we can understand why that might be; the older Realtek ALC898 codec used here delivers the scratchy hiss-fest we're accustomed to from onboard solutions.

A total of eight SATA 6Gbps ports are included, with the extra two provided by a Marvell chip. The total number of USB 3.0 ports has increased by the same amount, with the extra two courtesy of a Renesas solution.

This middle-of-the-road feature set is matched by dead ordinary performance – not too slow, yet not too fast. Overall, Gigabyte has delivered a solid and – if uninspiring – affordable option for those who want a jack of all trades PC.



Intel DZ87KLT-75K

The definition of ordinary.

@ www.intel.com.au

✓ Excellent performance, includes a PCI slot, skull diagram is radical.

✗ Boring audio, boring layout, boring features.

\$295

6/10

i INTEL 1GBIT/SEC LAN
HDMI OUT
BACK-TO-BIOS BUTTON

Considering Intel is the company that makes the chipset at the heart of these boards, is it wrong to expect its implementation of the Z87 to be top notch? That's the expectation we had walking into the review of the Intel DZ87KLT-75K, but it appears this chip-giant could learn a thing or two from the smaller Taiwanese companies.

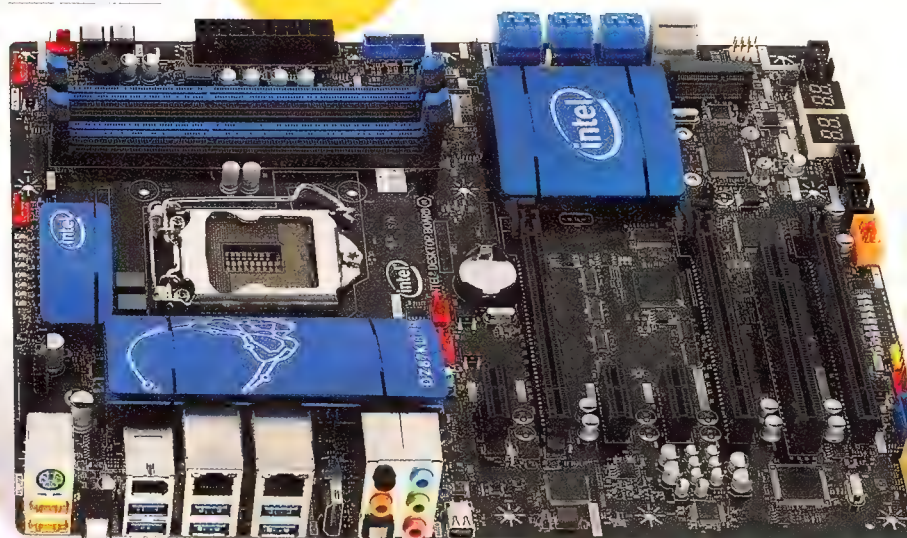
At a hair under \$300, the board sits around the middle of the pack when it comes to pricing. As expected, this is backed up by some rather middle-of-the road specifications. Onboard audio is handled by the spectacularly average Realtek ALC898 codec, and Intel has done absolutely nothing to make it perform any better than usual. Unsurprisingly, it sounds pretty damn ordinary.

The total number of SATA 6Gbps ports has increased to eight; even Intel seemingly realises six just ain't enough. Three PCIe x16 slots combine with three PCIe x1 and a single PCI slot. (We have to question why Intel is including that old PCI slot when their Z87 chipset has officially removed all support for it.)

Other than that, there's really nothing here of note to write home about. The graphical BIOS is one of the least intuitive, but that might be due to the fact that Intel goes for a very different layout to the big motherboard manufacturers, so we simply weren't accustomed to it. About the only cool thing about this board is the picture of a skull on one of the heatsinks. Like, *gnarly*, dude. Even the video outputs are

pathetic, with just a single HDMI.

Where the DZ87KLT-75K didn't disappoint, however, was in system performance, posting some of the fastest results. And yet we still can't justify spending so much on such an ordinary motherboard. There are far better examples to be had for significantly cheaper prices.



MSI Z87-G43

Welcome to Budget Town.

@ www.msi.com

✓ Incredibly cheap for a Z87 board, solid performance, covers the basics.

✗ Nothing fancy to see here.

\$159

7/10

i RAID 0/1/5/10
REALTEK 8111E
GIGABIT ETHERNET
TWIN CROSSFIRE
SUPPORTED, BUT NO SLI

The Z87 chipset is intended to be Intel's premium chipset, housed in the very best motherboards on the market. If you want something cheaper, there's myriad other chipsets available in the Series 8 product line to choose from. Those facts make the Z87-G43 a rather baffling proposition; priced at a meagre \$159, it's well below the price of every other board in the roundup, yet it's still powered by the high-flying Z87 chipset. How has MSI pulled this off?

Looking at the board reveals the secret: this is a product that's built to a price point. There's absolutely no bling, with simple yet attractive heatsinks covering the crucial components. Forget onboard power and reset buttons or diagnostic LED displays – there's none of that here. Instead, you get twin PCIe x16 slots (one is PCIe 3.0, the other PCIe 2.0), three archaic PCI slots and a couple of PCIe x1 slots. The focus on the older PCI slots highlights the target audience – those on penny-pinching budgets who hang onto their old gear for as long as possible.

The bare basic six SATA 6Gbps slots are included, while USB 3.0 has been trimmed back from the default six to just four, only two of which are available on the rear I/O board. The audio subsystem hasn't been given any love, using the Realtek ALC892 clunker to deliver barely acceptable audio. Yep, what we have here is a very simple motherboard, since lots of people need just the basics. Considering the respectable performance of the MSI Z87-G43, this board is easy to recommend for those who want a motherboard for a regular, everyday PC, delivering solid performance, average features and healthy reliability.



MSI Z87-GD65

Built to be gaming-tough.

@ www.msi.com

✓ Good onboard audio, killer Ethernet, SLI/CrossFire ready.

✗ Inconsistent performance, Realtek audio.

\$255



i DDR3 3000MHZ
MILITARY CLASS 4
CERTIFICATION
EIGHT SATA
6GBPS PORTS
AND SIX USB 3.0



All of the major brands have focused on gamers for the launch of Z87 and MSI is no exception. With PC gaming one of the few happy stories about desktop computing, we've never seen such tight competition before. MSI has taken a slightly different approach to Gigabyte and ASUS though, aiming to squeeze in some of the killer features of the \$500 boards, in a product just half the price.

One of those features is the Killer E2200 game network port, which apparently delivers superior gaming performance while engaged in other downloads. It's the same product as found on the G1.Sniper 5, and we've tested them in the past – let's just say your mileage may vary, but it's a nice-to-have kind of feature. MSI has also paid special attention to the onboard audio, which is branded as a Sound Blaster Creative Cinema solution. Closer examination reveals Realtek's ALC1150 codec powered by Creative software, with the hardware enhanced by EMF shielding and high quality amps. It's not quite up there with the Sniper's soundcard-destroying solution, but it's still perfectly useable for most gamers. The last gamer-iffic component is the gold-plated mouse port, with extra high polling for gaming mice. During testing we didn't notice a lick of difference between this port and another port, and we used our beloved SteelSeries Sensei for testing.

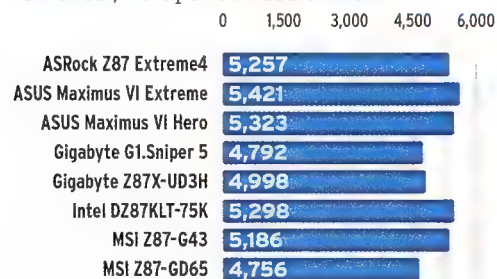
Triple PCIe x16 slots enable SLI or CrossFire and there's four PCIe x1 slots for extra room. The custom MSI skin on the UEFI BIOS is well laid out and has some of the better automatic overclocking options. Plug in an MSI graphics card and that will automatically overclock as well.

There's one slight issue, though: inconsistent performance results, with a particularly worrying PCMark 8 score. Thankfully, this MSI unit performed much better in the gaming tests. Throw in an excellent price with all of these gaming-focused goodies and the Z87-GD65 is a killer gaming board that won't murder your bank account. **ADC**

LABS BENCHMARK RESULTS

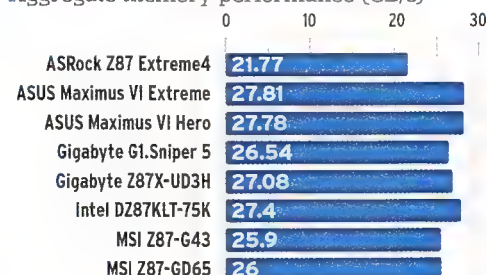
GENERAL SYSTEM PERFORMANCE: PCMARK 8

Home test, no OpenCL acceleration



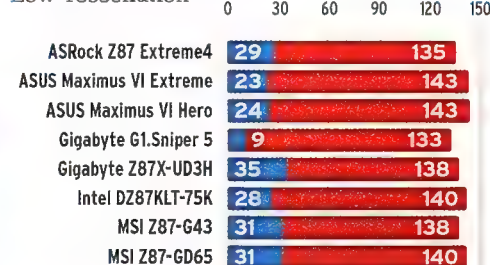
GENERAL SYSTEM PERFORMANCE: SISOFWARE SANDRA MEMORY BENCHMARK

Aggregate memory performance (GB/s)



GAMING PERFORMANCE: METRO: LAST LIGHT

1,024 x 768, DX10, Ultra Low Quality, Low Tessellation*

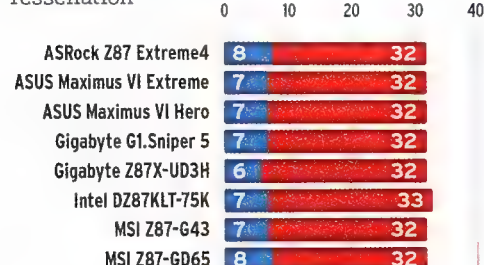


■ Min FPS ■ Avg FPS

*Tested with AMD Radeon HD 7970

GAMING PERFORMANCE: METRO: LAST LIGHT

1080p, Very High Quality, Very High Tessellation*

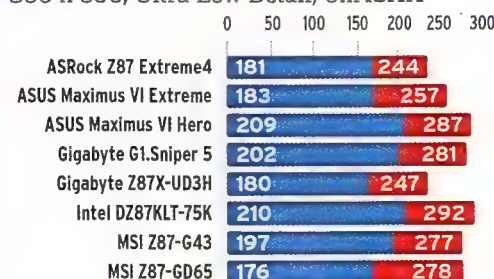


■ Min FPS ■ Avg FPS

*Tested with AMD Radeon HD 7970

GAMING PERFORMANCE: GRID 2

800 x 600, Ultra Low Detail, 0xMSAA*

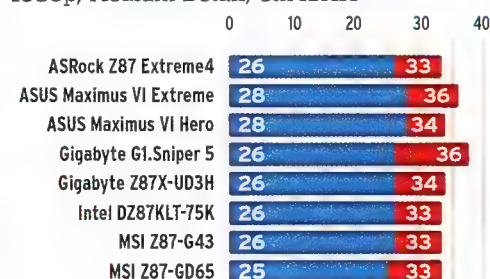


■ Min FPS ■ Avg FPS

*Tested with AMD Radeon HD 7970

ONBOARD GRAPHICS PERFORMANCE: GRID 2

1080p, Medium Detail, 0xMSAA



■ Min FPS ■ Avg FPS

*Tested with AMD Radeon HD 7970

THE GAME-CHANGERS

Bennett Ring uncovers the Computex tech trends that are reshaping the future of PC gaming.

With the mainstream desktop PC market continuing to decline faster than Labor's poll numbers, PC hardware manufacturers are focusing on the few profitable areas with a laser-like focus. If the number of related products at Computex 2013 is any indicator, one area in particular appears to be a continual source of cash: PC gaming. Computex had more gaming gear than your average internet cafe, with every man and his silicon-spinning dog trying to cash in on this prosperous source of income. Obviously this made it a little harder to see the forest for the trees, but after spending four sweaty days wearing our soles thin, we've come up with a list of the top 10 gaming trends and innovations at this year's show. Join us as we count down the top 10 PC gaming hardware game-changers from Computex 2013.



JUNE 4 - 8, 2013
COMPUTEX
TAIPEI

something of a surprise to see hardly any at the 2013 show. In the past it was impossible to pass a laptop booth without at least one screen having bullets and bombs blasting

out of the frame, but this year we counted exactly one 3D laptop. Ditto in the land of displays, where the focus was more on multiple screens with thin bezels than 120Hz refresh rates. We're not sure why this is the case. With Nvidia's 3D Vision 2 performing better than ever and PCs now armed with more than enough power to deliver smooth frame rates in 3D, it should be time for the technology to really mature and take off. Perhaps it's got something to do with the immense popularity of AMD's Radeon HD 7970 GHz Edition graphics card, which has rather piecemeal 3D support?

10 3D IS DEAD

Over the last few years we've been blown away by how many different 3D displays were on show at Computex, so it was

09 GAMING MOTHERBOARDS

It's getting harder for motherboard manufacturers to differentiate their products from the dozens of other nearly identical motherboards on the market, so MSI, Gigabyte and ASUS all chose to focus on their new



GAMING MOTHERBOARDS

B

09

C



- A** We saw only one lonely 3D laptop at the show this year.
- B** Motherboard manufacturers' focus was clearly on gamers.
- C** The chipset of choice seems to be the high-end Z87.
- D** Nvidia's new Shield streams PC games to a handheld console.

NVIDIA SHIELD

08

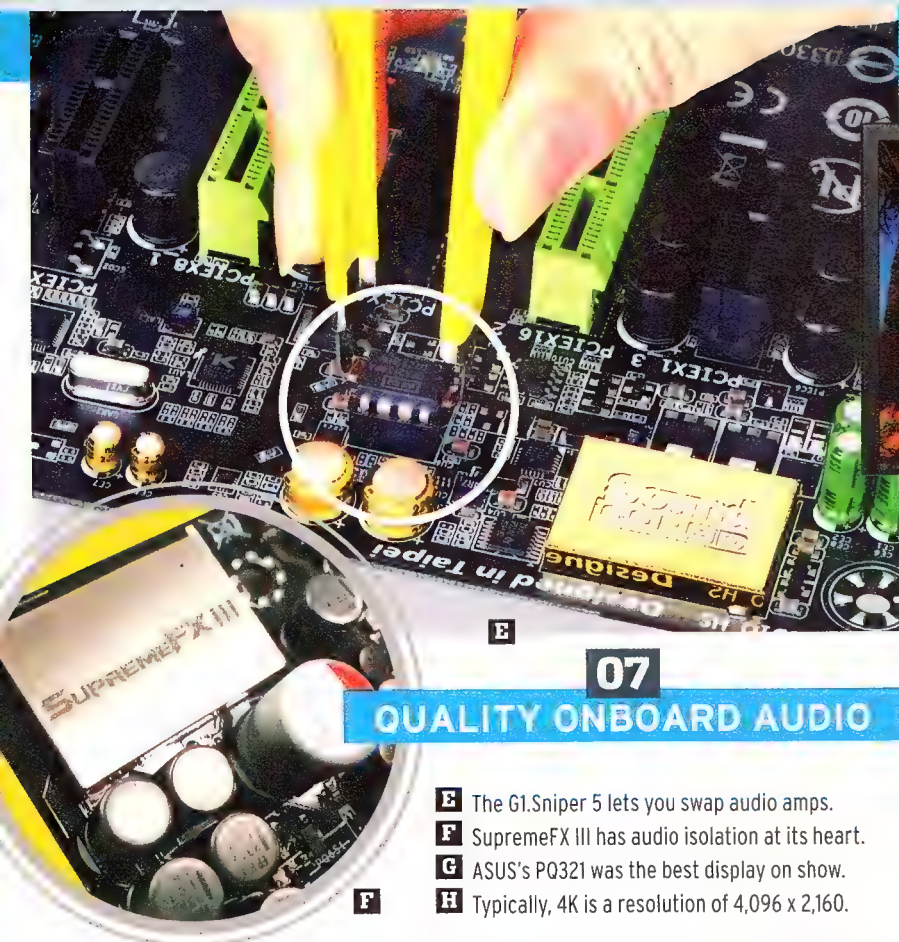
D



10

3D IS DEAD

A



07 QUALITY ONBOARD AUDIO

- E** The G1.Sniper 5 lets you swap audio amps.
- F** SupremeFX III has audio isolation at its heart.
- G** ASUS's PQ321 was the best display on show.
- H** Typically, 4K is a resolution of 4,096 x 2,160.



gaming ranges. All of these products are designed for the new fourth-generation Core CPU from Intel, with the predominant chipset being the high-end Z87. These boards differ from mainstream snoozers thanks to a comprehensive feature set that's tailor made for the interactive-addicted. Most have much better audio solutions than you'll find on a business board, delivering crisp, clear audio to your headphones or speakers, perfect for bringing your games to ear-punishing life. Several of the gaming boards at the show, such as MSI's new range, also include the Killer E2200 Gaming Network chipset, which promises to prioritise game packets when you're busy downloading movies and sending emails.

Serious gamers use multiple graphics cards in their PC builds, so all of the gaming boards support a bare minimum of two cards in Nvidia's SLI or AMD's CrossFire modes. However, if you've got too much money and want to run three or four graphics cards, you'll need one of the more expensive gaming motherboards such as Gigabyte's G1.Sniper 5, which uses a special PLX chip to increase the bandwidth to the PCIe slots. These boards start at around the \$400 mark and soar north from there.

We also saw a few gaming boards based on Intel's new B85 chipset, which is designed for commercial rollouts. It's cheap without being nasty, and offers very similar performance in games to the more expensive Z87 chipset, at the cost of the removal of overclocking support.

08 NVIDIA SHIELD

Nvidia used Computex to show off working samples of its new Shield product, which looks like the mutant offspring of an Xbox controller mating with a 5-inch smartphone. Powered by Android, users can take the Shield controller anywhere to play their favourite Android games and the inclusion of the dual analogue sticks makes it the superior way to play when compared to the often woeful touch controls of a smartphone. However, it's what Shield can do at home that's most impressive.

If you're running an Nvidia-powered gaming PC in the house, it's possible to wirelessly stream games from the PC to the Shield. Want to keep playing *Battlefield 3*, but your other half insists you come to bed? Simply fire up the Shield and you can keep playing from under your doona. With 2GB of onboard RAM, 16GB of long-term storage, Wi-Fi and GPS, all powered by the Nvidia Tegra 4 processor, it's a very capable gaming unit. The screen is impressive, with a crisp 1,280 x 720 resolution.

Shield's PC streaming feature is intended to only work with high-end Nvidia hardware, but there's nothing stopping an intrepid hacker from stitching together support for AMD Radeon graphics. With a US\$349 price point, Nvidia still hasn't announced launch plans for Australia, although the US will reportedly get it before the end of June.

07 QUALITY ONBOARD AUDIO

Gaming audio hardware has been left outside in the cold ever since Microsoft banished Creative's Sound Blaster cards with the creation of Windows Vista. Since then, most gamers have mistakenly held the belief that cheap motherboard audio is good enough, but those in the know realise that this is a terrible way to listen to your games. Onboard audio suffers from distortion and interference, and the only remedy until now has been to spend \$100 or more on a dedicated sound card.

However, we're very happy to report that high-quality onboard audio solutions are now included on most of the gaming and premium boards seen at the show. Many use Creative's Core3D digital sound processor, while MSI is sticking with the more affordable Realtek solution, albeit upgrading it to the latest ALC1150 audio chip. No matter which chip is used, all of these processors are now EMF shielded and powered by audiophile-grade capacitors. This shielding is accomplished by hiding the audio chip under a special metallic shield, as well as separating the audio components from the other pieces on the motherboard via a special barrier in the board's PCB material.

Many of these motherboards also included headphone amplifiers. Gigabyte's headphone amps are removable, allowing the user to install more expensive headphone amps if desired, which can cost anywhere between \$1 and \$40, depending on the quality level. We tested out the G1.Sniper 5's audio with a \$5 Burr Brown amplifier and were blown away by how good it sounded. Gigabyte also uses gold plating on its audio outputs to increase the connection quality, but sadly the headphone amp doesn't work if you're using 5.1 or 7.1 speakers. Despite this small limitation, it's a relief to hear that onboard audio will finally rival dedicated sound card quality, freeing up another PCIe slot for other uses.

06 4K

Just as the world finally gets around to using 1080p Full HD, along comes another standard to make all of our screens obsolete once more. 4K uses a whopping resolution of 4,096 x 2,160... sometimes – the standard has several resolutions, as you'll see. This makes games and movies look even crisper and clearer than today's already excellent standards, with pixels basically impossible to spot. We saw several new displays at Computex running this new resolution and it's just as expensive as you'd expect.

The best of the bunch was the new PQ321 display from ASUS, which has a slightly lower resolution of 3,840 x 2,160, which is still technically 4K. Measuring 31.5 inches across the diagonal, it's not that much larger than Dell's finest 30-inch displays. However, at US\$3,799, it's almost double the cost. Unfortunately, the demo unit only ran at 30Hz, but ASUS

claims it will support 60Hz over a DisplayPort connection. The image quality was absolutely spectacular, making today's HD screens look positively low resolution. Unfortunately, gamers will need some serious hardware to drive so many pixels, in the realm of triple GeForce GTX Titan graphics cards, which retail for \$1,200... each.

We don't know anybody foolish enough to spend \$7,500 just to game at 4K, but now that the first semi-mainstream PC monitor is on sale, prices will inevitably plummet over the coming years. We give it five years before 4K becomes truly affordable and by that stage, PC hardware should easily keep pace with its heady demands.

05 OPTICAL MICE

Everything old is new again! It's a saying that applies perfectly to PC hardware, where old trends become new trends every few years. At this year's Computex, one trend from the past raised its weary head once more, in the form of optical mice.

For the last few years, gaming mice have all used digital sensors, which offer incredibly high accuracy; the latest breed are capable of 8,200dpi tracking. However, hardcore first-person shooter players have started to flock back to optical mice, preferring their feel at lower dpi settings. Speaking to one ex-pro *Counter-Strike* player at the show about the issue, he mentioned that optical mice are less likely to register movement when the player lifts it off the mouse pad. They're also perceived to be more accurate when run at lower dpi settings, which is the preferred setting for serious shooters. With optical mice releasing from ASUS, Roccat and Thermaltake, it appears this old tech is set for a revival. And yet, we're not quite convinced. Speaking to one mouse engineer about it, he claimed that laboratory testing didn't indicate a noticeable difference between the two types and that optical mice are only making a comeback because that's what gamers are asking for.

04 NVIDIA GEFORCE GTX 700 SERIES

In the week prior to Computex we received our first GeForce GTX 780 and 770 review samples (see APC July, page 20), so it was no surprise to see Nvidia's latest product dominating the graphics card wars at Computex. Every major graphics card manufacturer had one on show, with the exception of MSI's famous Lightning range. This series is known for being a serious overclocker, although MSI didn't have one on show, instead preferring to show off its basic 700-series products.

Several companies demoed GTX 770s and 780s with special water coolers, one of which was an EVGA model that was a single slot wide, an huge accomplishment for such a powerful graphics card. Surprisingly, Nvidia didn't use the opportunity to show off the inevitable GTX 760 product that we knew was waiting in the wings; given this will probably be its most popular product in 2013, it was a surprising omission indeed.

Not as surprising as AMD, though. After signing an NDA with the folks in red, we expected to be briefed on the company's rumoured Radeon HD 8000 series. Instead, we were shown a new tech demo created by AMD, Ruby, which would release several weeks after the show. To say we were a little disappointed is like saying Taipei is a little bit humid.

03 WATER COOLING

With Intel's fourth-generation Core CPU cranking out much more heat than expected on the desktop, gamers are going to need a serious cooling solution to keep their chips chilly, especially if they're overclocking. The good news is that there are now dozens of water cooling solutions hitting the market, with Cooler Master, NZXT, Asetek, SilverStone, Thermaltake and other companies all showing off brand-new water cooling products.

As expected, they're now packing even more powerful pumps than ever before, although there were a couple of improvements that we didn't expect. Most exciting of all is a push for standardisation among the major water players, allowing components from different brands to all play together happily in a single water loop. Instrumental to this support is the new G1/4-inch universal pipe fitting, which also debuted on several motherboard and graphics card coolers.

SilverStone had a very interesting concept cooler on show, which did away with the noisy pump entirely. Rather, it uses the motion of heated water to flush its coolant through the radiator silently, but there's one major issue with this. The water doesn't start moving until the coolant hits 40°C or so, which means it's no more effective than an air cooler. It also requires fans on the radiator, so it hasn't done away with the noise entirely. Still, it's a promising first look at a tech that might become commonplace in more affordable water cooling kits in the near future.

02 GAMING LAPTOPS

There are gaming laptops and then there are gaming laptops that can actually play games. The Australian market has been flooded with gaming laptops of the first type, but 2013 should see this problem resolved. The cure is Nvidia's new GTX 700M series, a set of mobile GPUs based on the Kepler design. This is the same design at the heart of the GTX 680, 670, 770, 780 and Titan, and it's known for being incredibly power-efficient while delivering snappy performance.

This has allowed laptop makers to start fitting more powerful GPUs into smaller laptops. We lost count of the number of ultrabooks packing the entry-level GTX 765M chipset and live demos showed good performance. However, to get truly high-end performance you'll need to step up to the GTX 770M or 780M, which requires a thicker chassis.

- H** Roccat's Kone[+] features an 8,200 dpi sensor...
- I** ...but many pro gamers are flocking back to optical mice.
- J** The GeForce GTX 770 demoed with special water coolers.
- K** Windforce, equipped with anti-turbulence inclined-fins.



H



J

K

NVIDIA GEFORCE GTX 700 SERIES

04

05 OPTICAL MICE

I





- O** MSI fits a powerful GPU in a tiny laptop.
- P** High-end gaming laptops cost \$3,000.
- Q** Tiny gaming desktops were a big trend.
- R** ASUS packed an impressive gaming solution with high-end audio.
- S** EVGA's compact mini-ITX system included a GTX Titan.
- T** The M8 machine, by ASRock.



02

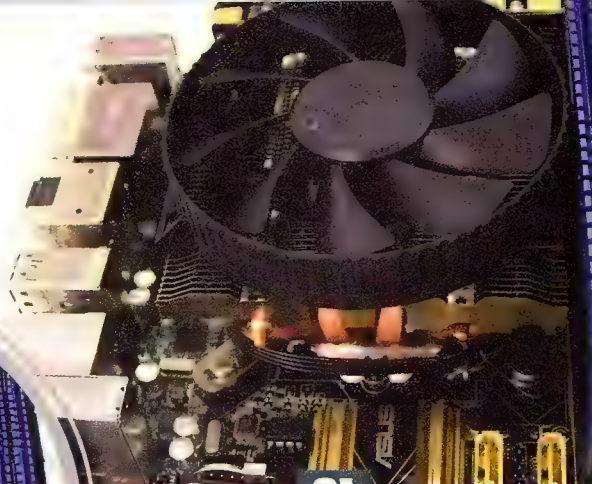
GAMING LAPTOPS



R



S



01

SMALL FORM FACTOR GAMING

T



Models from MSI, Gigabyte and ASUS all included these new high-end products, with prices starting around the \$3,000 point. Origin PC, custom builders of stupidly fast laptops, showed us a prototype of its new Eon system, which goes one better and packs twin GTX 780M GPUs into the laptop. Talk about overkill.

01 SMALL FORM FACTOR GAMING

The biggest gaming trend of the show was also the smallest – the push towards tiny gaming machines. It's now possible to build a high-end gaming PC that's smaller than a shoebox and instrumental to this is Intel's new fourth-generation Core CPU. Unlike prior CPUs, all of the voltage controls are now packed into the CPU, which means motherboard manufacturers need even fewer chips on the board. This in turn allows for tinier boards and this year Computex was awash with mini-ITX motherboards.

You probably haven't heard of this format before. The last time we saw it was back in 2002, when VIA was pushing highly embedded mini-ITX machines to the market. They were very expensive yet underperforming, meaning they ended up being used in industrial and point-of-sale displays more than on users' desktops. Fast-forward to today and these new 17 x 17cm boards are everywhere, with versions

released by every major motherboard manufacturer at the show. ASUS and EVGA had two of the most impressive, packing powerful gaming solutions that included high-end audio. We saw EVGA's solution set up in a tiny case, running the blazing-fast fourth-gen Core i7-4770K with a GeForce GTX Titan, all cooled by a tiny water cooler.

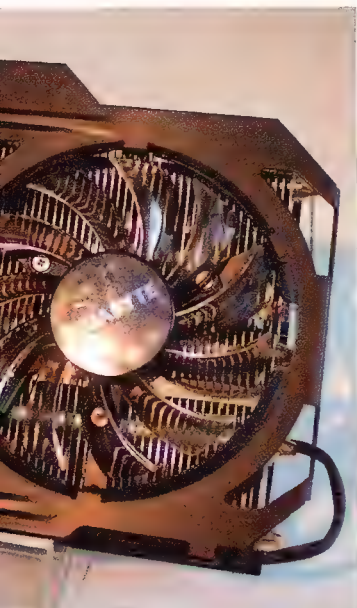
Micro-ATX was also present in a big way – it's a format that's slightly larger than mini-ITX, measuring 24.4 x 24.4cm at the upper end of the scale. Obviously micro-ATX systems are a little larger than mini-ITX, but they're still incredibly portable. They include several PCIe slots, instead of the single slot found on mini-ITX motherboards, allowing for more flexible build configurations.

Accompanying this flood of mini motherboards was a deluge of itty bitty cases. Every major case builder had tiny cases for these micro-products, with new chassis from BitFenix, Cooler Master, Thermaltake, SilverStone, Antec and many more. The sexiest was the M8 barebones machine from ASRock, which has been designed by one of the folks behind BMW's M series. While the main use envisaged for these tiny computers is for use in LAN boxes, this hobby isn't very popular down under. However, folks who want a small gaming box to go in their AV rack under their TV or projector will find the new shrunken dimensions absolutely perfect. It could finally be time to build that Steam Box you've been dreaming of. [ETC](#)



L

M



03

WATER COOLING



N

- L** Water cooling pumps have never been so powerful or affordable.
- M** The new G1/4-inch universal pipe fitting.
- N** Components from different brands can now work together in a single water loop.

A QUIET BUT POWERFUL GAMING RIG

We love pure PC power and hate noise, so [Tom McNamara](#) set out to satisfy both primal desires with a hand-built and almost totally silent gaming PC.

Powerful computer components often run hot, which requires loud fans or expensive liquid to cool them, bringing us to a central conundrum of the PC power lifestyle: we want a big, powerful PC, but we want it to make as little noise as possible. Not only do noisy computers make it more difficult to relax, but there's a principle at work here – you should be the master of the space where you put your PC; you must bend it to your will, not the other way around.

This month, we decided to do just that and build a supremely powerful rig, then smother its noise output as best as we could. We haven't built a PC like this in a while, so the project gave us the chance to check out some new gear specifically designed for quiet computing, including a fanless CPU cooler from Zalman and a closed-loop liquid cooler built for video cards. We stuffed it all into a case from Fractal Design and then tried to overclock the PC because, well, that's what we do here.



Starting out, we figured the thing that would probably make the biggest difference in our build (besides the components, of course) would be sound-absorbing panels. This would allow us to have some fans inside the system, as building a fanless PC with any amount of horsepower is simply impossible. Therefore, we went with Fractal Design's Define R4 – a midtower known for its sonic excellence and balance of price and features.

We also liked the idea of a fanless CPU cooler, as Zalman has just released the FX100, and it would mean a major element of our machine would be totally silent, even when running at full speed. The only problem is it would also pretty much guarantee that we wouldn't be able to overclock due to heat buildup, which is always a problem with fanless coolers. Zalman also sent us a 92mm fan that could be dropped into the centre column of the heatsink if we ran into cooling issues. Zalman labels the fan as 'optional' for those running Socket 2011 or 1155, although we'd add overclockers to that list as well. We also used a 140mm Fractal Design fan, which we slapped in the front of our case for some additional airflow.

In the GPU department, we happened to have an Nvidia GeForce GTX 680 with a closed-loop water cooler from Arctic Cooling that includes a 120mm radiator and fan, so we used that since it's just what the rig doctor ordered. Rounding out our components was a quiet PSU from Cooler Master, a solid-state drive (SSD) from OCZ, a 1TB Caviar Black hard drive from Western Digital and a couple of sticks of RAM from Corsair.

INGREDIENTS

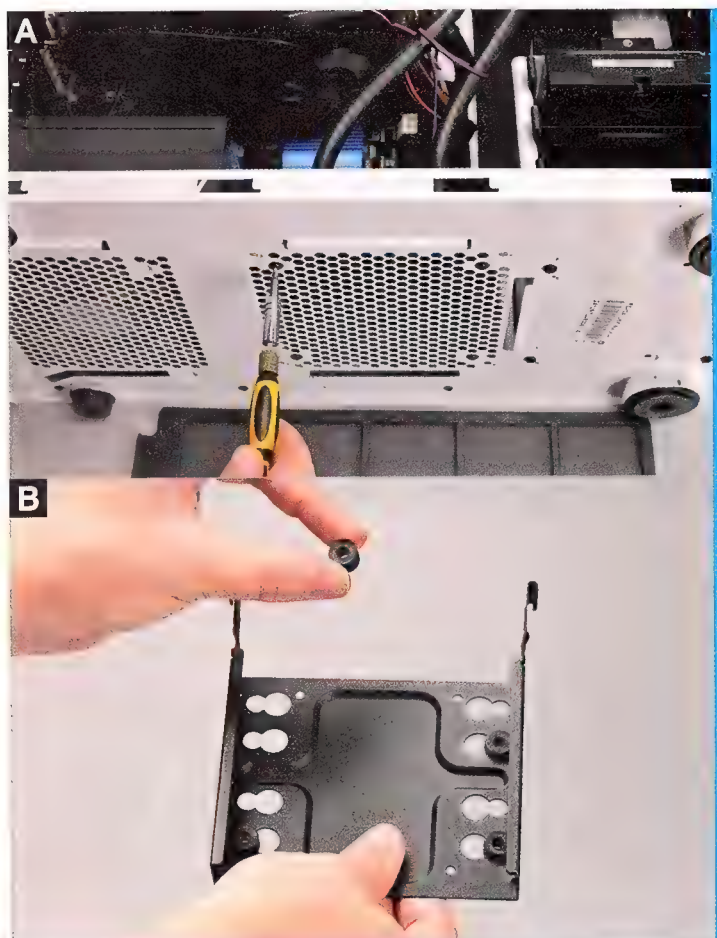
	Component	Price
Case	Fractal Design Define R4	\$149
Case fan	Fractal Design Silent Series R2 140mm	\$19
PSU	Cooler Master 800W Silent Pro Gold	\$185
Motherboard	Gigabyte GA-Z77X-UD3H	\$165
Processor	Intel Core i7-3770K	\$360
CPU cooler	Zalman FX100	TBA
Graphics card	Nvidia GeForce GTX 680	\$550
GPU cooler	Arctic Cooling Accelero Hybrid	\$125
Memory	Corsair Vengeance 2x 4GB	\$75
SSD	OCZ Vertex 4 128GB	\$150
Hard drive	Western Digital Caviar Black 1TB	\$100
Operating system	Windows 7 64-bit OEM	\$100
Total		\$1,740

01 Hybrid Theory

We didn't want to sacrifice video card performance to achieve low noise, so we got creative. We've previously installed an Arctic Cooling Accelero Hybrid closed-loop liquid cooler on an Nvidia GeForce GTX 680 – these don't run as toasty as comparable AMD cards like the Radeon HD 7970, making our job a little easier. The Hybrid is basically like a Corsair H100, but designed for GPUs, so it made sense to tuck this puppy into our build. The Fractal Design case we chose had an unoccupied 120mm fan grille on the bottom of the case, next to the power supply, which was perfect for our Hybrid's radiator and fan (see image **A**). It's difficult to hear noise coming through the bottom of a case, so we used that to our advantage.

02 European Styling

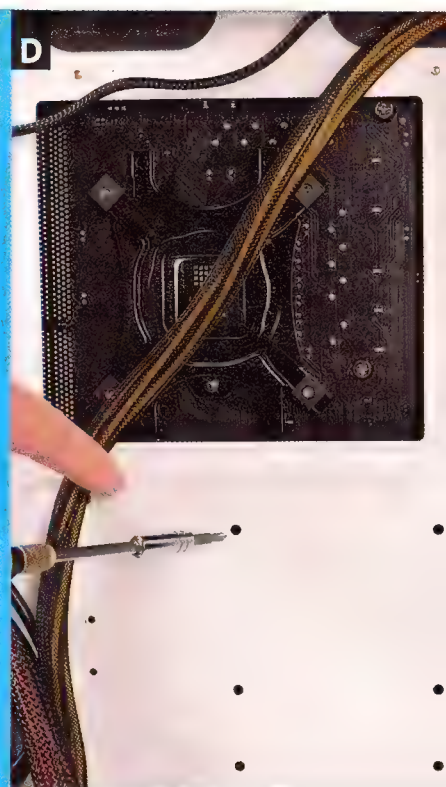
We were looking forward to working with the Fractal Design Define R4 case for more than just its built-in sound-dampening panels. It's also about an inch wider than normal, so there's more room behind the motherboard tray for cable management. The extra width also leaves room to add a 140mm radiator to the rear exhaust fan, but we don't need that feature this time. In addition, the drive cages have preinstalled rubber feet designed to absorb the vibration of a mechanical drive's moving parts (see image **B**). We also decided to remove the upper drive cage, which was secured with a couple of thumbscrews, to increase airflow in the middle of the chassis where our GPU is located. Besides, we didn't need the second drive cage since we were fine just using the three bays in the lower cage. The power supply mount also has rubber feet and a gasket in the rear that helps with sound absorption and dust prevention.



03 Enjoy the silence

Even though the case includes one intake fan and one exhaust fan, we wanted a third case fan to help provide some airflow to our fanless CPU cooler. The R4 has two intake fan mounts in the front and we weren't worried about adding an extra fan to a 'quiet PC' because the added noise would be muffled by sound-dampening material. We used the unoccupied lower mount to install the Fractal Design R2 fan, which is like the R4's stock fans in that its blades are shaped to reduce turbulence.

To install it, we just pressed on the fan grille to pop it open, affixed the fan to the included cage and then snapped it shut – no tools needed (see image **C**).



04 The Drive to Win

We decided to skip an optical drive, since they can make a lot of noise when they spin up, and installed Windows from a USB stick. For our OS we naturally wanted an SSD because they have no moving parts and make no noise, so we went with an OCZ Vertex 4 because it's one of the best performers at 128GB and its size is sufficient for our OS needs. The Define R4 allows you to install two SSDs underneath the motherboard tray, between the board and the case. However, the screws go through the top of the tray (see image **D**), so the motherboard needs to be removed to install the drives. For simplicity's sake, we installed the SSD next to the mechanical drive in the lower drive cage, as its slide-out trays have screw holes for SSDs. There was enough room between the back of the drives and the side panel that right-angle SATA cables were not required.



05 One Less Fan

We really liked the idea of using Zalman's new fanless CPU cooler for this build, since it's totally silent and would go a long way toward minimising our machine's sound output. After all, the CPU cooler, along with the GPU cooler, is responsible for the lion's share of the noise a system emits. Since we already had the GPU on a liquid diet, silencing the CPU should make our machine so quiet that not even a dog could hear it. Of course, we also wanted a high-performance machine, so we were taking a bit of a gamble on whether a fanless cooler would work, but we figured it was worth a try.

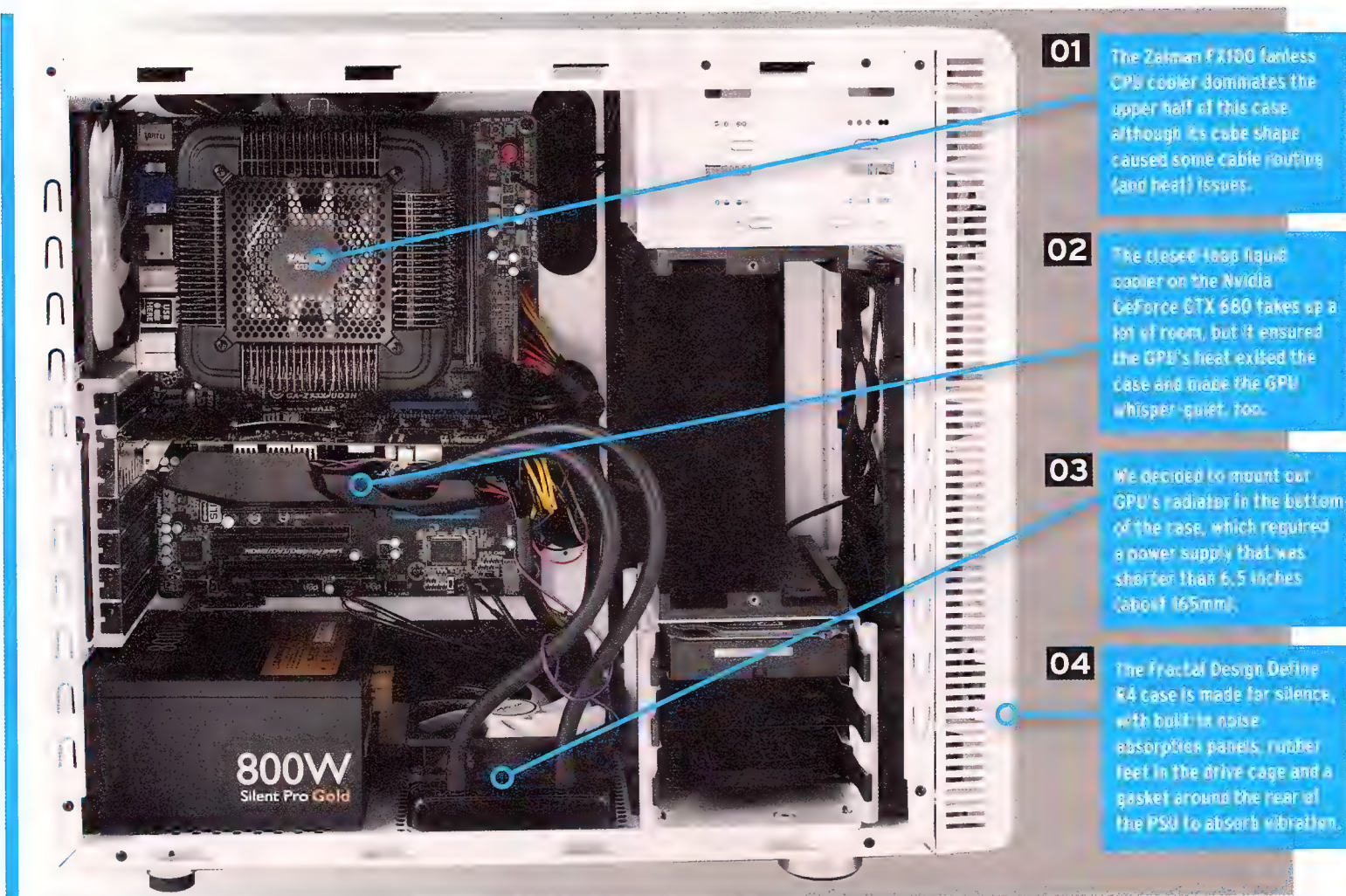
Since it's a passive cooler, the Zalman is absolutely massive. This made plugging things in around the CPU socket tricky, as the cooler mostly obstructed the eight-pin motherboard power connector (see image **E**). The CPU fan header was also completely out of reach (Zalman bundles in an optional 92mm ZM-SF2 fan). You can install the cooler with the fan before putting your motherboard in the case, but then the cooler blocks the eight-pin connector. With the fan plugged in, we had to tilt the board about 30° to wrestle the eight-pin cable into its socket.

06 Fighting the Power

Power supplies are another area where we can eliminate noise. When your system starts demanding a lot of power, that power amounts to a lot of heat going through the PSU. Its fan may have to spin pretty hard to keep up, so you want a PSU with a fan that won't create a lot of turbulence when you crank it to 11. We began our build with a Cooler Master 720W Silent Pro M2 and as its name implies, it's designed to operate quietly. We'd used it in a previous build, so we could confirm it wouldn't emit more than a low hum. It seemed like a no-brainer to drop in our Define R4 case.

Unfortunately, the M2 was about half an inch too long and didn't leave enough room for the Accelero Hybrid radiator, which we mounted on the bottom fan grille next to the PSU. It seemed simpler to just get a different PSU rather than mount the Hybrid where its fan would be easier to hear. We had several other options on hand and ultimately chose the Cooler Master Silent Pro Gold (see image **F**) because it's received positive reviews for its silent operation.





- 01** The Zalman FX100 fanless CPU cooler dominates the upper half of this case, although its cube shape caused some cable routing (and heat!) issues.
- 02** The closed-loop liquid cooler on the Nvidia GeForce GTX 680 takes up a lot of room, but it ensured the GPU's heat exited the case and made the GPU whisper-quiet, too.
- 03** We decided to mount our GPU's radiator in the bottom of the case, which required a power supply that was shorter than 6.5 inches (about 165mm).
- 04** The Fractal Design Define R4 case is made for silence, with built-in noise absorption panels, rubber feet in the drive cage and a gasket around the rear of the PSU to absorb vibration.

Silent but deadly

Although it took time and some creativity to fit the FX100 fanless CPU cooler into the Define R4 case, due to the cooler's unusually large dimensions and the case's mid-size stature, it was able to keep our Core i7-3770K temperatures in the mid-70°C range with Prime95 running its most challenging test (in-place large FFTs). (We chose a 3770K over a newer 4770K specifically because the older chip runs a little cooler.) That mid-70s temperature isn't too shabby for a fanless cooler, especially considering that our CPU was running eight threads at 100% load. If you place a high premium on low noise and don't care about overclocking, this cooler may fit your needs, assuming you can wedge it into your chassis. In retrospect, we would have preferred either a smaller cooler or a larger case, as this particular combo provided woefully little clearance between the top of the motherboard and the top of the case, which made connecting the eight-pin power cable in the corner of our motherboard a major chore. Many full towers fit that description and Fractal Design makes a full-tower version of this case called the Define XL R2.

After we had finished installing the FX100's optional 92mm fan, CPU temperatures were about on par with similar-size 'skyscraper' coolers like the Noctua NH-D14, with idle temperatures in the low-to-mid 30° range and load temperatures in the high 60° range, and it operated about as quietly. We were also able to get a stable overclock of 4GHz from a stock speed of 3.5GHz. Going higher created noticeable fan noise when the PC was under load, even with the R4's sound dampening.

Putting the Accellero Hybrid radiator on the bottom of the Define R4 chassis gave us the quietude we had hoped for, even when running GPU benchmarks. The Hybrid device includes a small fan blowing on the card, so the memory and voltage regulation modules didn't overheat. Since this fan didn't have to cool the GPU, it didn't have to work nearly as hard, so it stayed nice and quiet.

Overall, this build was one part cooling experiment and one part PC building exercise. While our final system was dead quiet, it took us a while to get there, thanks to the quirks of the fanless cooler and the stringent low-noise requirements we set for ourselves. Given a second shot, we'd go with a standard CPU air cooler with fans first, or water cooling. Maybe next time we'll cool both the GPU and the CPU with water, and maybe even try something as exotic as an exterior radiator/reservoir. **APC**

QUIET PC BENCHMARKS

	APC test bed	Quiet PC
Premiere Pro CS6 (sec)	2,000	2,820
Stitch.Efx 2.0 (sec)	831	836
3DMark11 Extreme	5,847	3,390
x264 HD 5.0 (fps)	21.1	15.5
ProShow Producer 5.0 (sec)	1,446	1,427
Batman: Arkam City (fps)	76	49

Our current desktop test bed consists of a hexa-core 3.2GHz Core i7-3930K at 3.8GHz, 8GB of Corsair DDR3-1600 RAM, ASUS Sabertooth X79 motherboard, GeForce GTX 690, OCZ Vertex 3 SSD and Windows 7 Professional (64-bit).

BENCHMARK YOUR PC

Testing your PC gives you an insight into more than just its performance, says [Alan Dexter](#).

Benchmarking, I'll freely admit, isn't everyone's idea of fun. It is worth doing if you suspect that something might be wrong with your PC, though. Indeed, it's worth doing from time to time anyway, just to make sure that your system is working properly.

Key to benchmarking is the software that you're actually using to test your system. There are plenty of neat little tools and utilities that you can use to make sure that the individual components of your rig are up

to speed, but I'm a fan of using a single program wherever possible, especially if it's a good one.

Thankfully, there is a suite of utilities that has been a mainstay of the benchmarking world for several years. That suite is SiSoftware Sandra (www.sisoftware.net). It offers the ability to check the performance of your machine for free, if you're just planning to use it for your own information (which we'll assume you are). Let's get started.

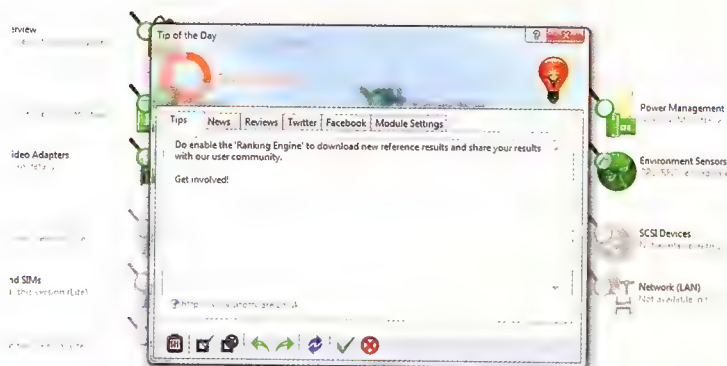
STEP-BY-STEP: BENCHMARK YOUR PC

Put your machine through its paces



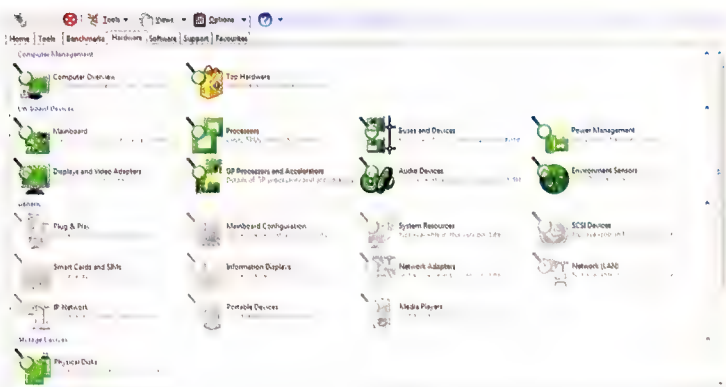
01 UP-TO-DATE

First, you'll want to grab the latest version of Sandra, which at the time of writing is up to version 2013 SP3a (19.44). Head over to www.sisoftware.net, click 'Download & Buy' at the top of the page, select 'Download' at the bottom of the 'Lite' column and then click the '64-bit X64' option from the 'Microsoft Windows Platform' list.



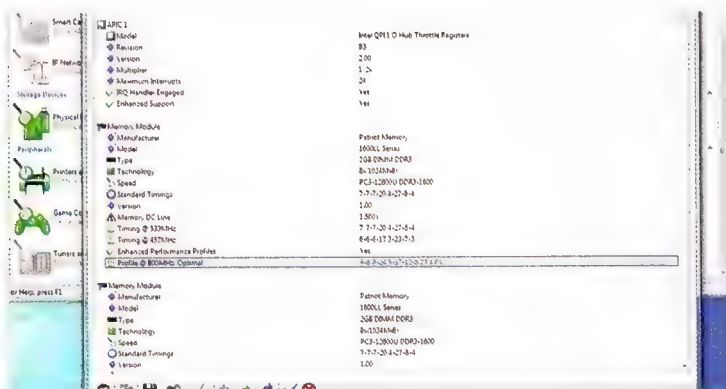
02 PICK IT UP

Now you need to pick trusted hosting sites to download Sandra from. These are all respected sites, but if you're unsure, select 'Benchmark HQ' and your download will begin. Once the program has downloaded, launch it and select the default installation options. Finally, click 'Launch Sandra at the end of the process'.



03 MAGNIFYING GLASS

Start by looking at the hardware reports Sandra creates after analysing the components in your system. This is useful for spotting driver incompatibilities or for spotting conflicts on older systems, but it's still a good starting point before hitting the benchmarking sections. Click 'Hardware' to see a list of supported hardware reports.



05 SWEET MEMORIES

Part of this list also displays information about the memory installed in your system. Here, for instance, we have three DIMM slots occupied – banks 0, 3 and 6 – and each one has a 2GB stick of DDR3 running at 532MHz. Scrolling down reveals that the memory is made by Patriot Memory and is rated at 533MHz at 7-7-7-20 timings.



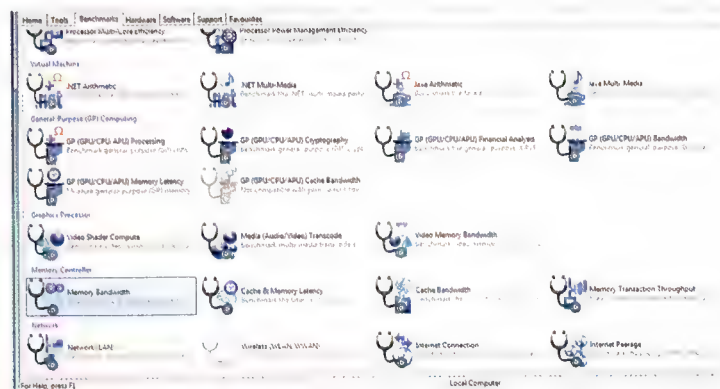
07 TIME TO BENCH

To run the benchmark, you simply need to click 'Refresh' – the icon made up of two blue arrows to the left of the tick mark. Once clicked, this will set Sandra to test the living daylights out of your memory. It can take a few minutes and you can't do anything else with your machine while it's running, so just let it do its thing.



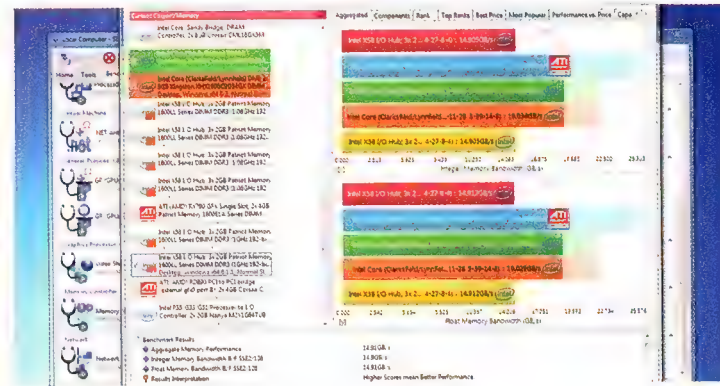
04 THE MOTHER-LOAD

Your motherboard is a key component, as it's responsible for making sure everything else works together. To get the lowdown on your motherboard, click the 'Mainboard' option in the 'On-board Devices' section. After a quick bit of scanning, you'll be presented with a long list of the key components of your motherboard, including the chipset.



06 BENCH YOUR RAM

How does this memory performance stack up against every other system out there? This is where Sandra's benchmarking tools step in. Close your motherboard report and click 'Benchmarks'. Scroll down until you get to the 'Memory Controller' subsection and then double-click the 'Memory Bandwidth' icon to launch that module.



08 COMPARATIVE ANALYSIS

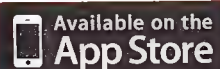
Once this is done, you'll be presented with a dynamic graph showing you how your memory compares to other setups. The tabs along the top present different rankings and information – such as how your memory compares to the best value options around, as well as how you rank compared to everyone else who has run Sandra.



TECH AUSTRALIA life



*On sale now for
only \$6.49*



iPad is a trademark of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.



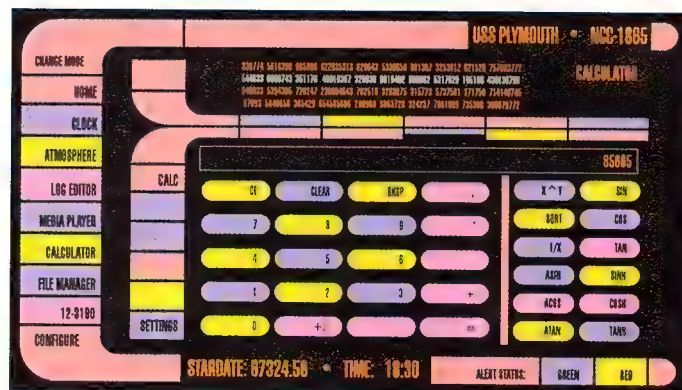
Windows 8 Store

LCARS Interface

Before 'Modern UI', there was LCARS.

\$2.99 | Davstar Apps | tinyurl.com/kmqbbe

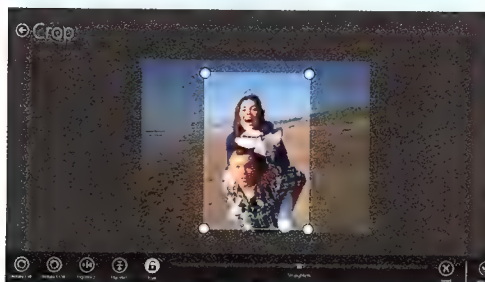
Truth be told, I'm currently trying to introduce my wife to the pleasures of seminal '90s *Star Trek* spin-off *Deep Space Nine*, but in all honesty I don't think she's really taking to it. Whenever alien characters appear sporting large amounts of prosthetic makeup (which is about 90% of the show, to be honest), she has a hard time taking it seriously. Alas, at least a poor old Trekkie like me can console himself with this neat little LCARS Interface app, which models itself on *Star Trek*'s computer UIs and provides a media player, built-in game, file manager, clock, calculator and so on. Truth be told, none of these will replace your Win 8 defaults, but it's an enjoyable little time-waster to tickle that Trekkie itch.



Adobe Photoshop Express

Free | Adobe Systems Incorporated | tinyurl.com/n6c65wc

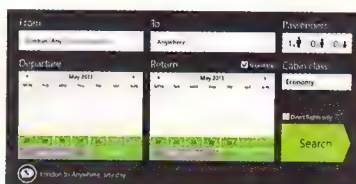
As far as photo-editors go, Adobe Photoshop Express – which has been an app store staple on other platforms for years now – is about as simple as they come (even for free software), but for most people its collection of easy-to-use tools will readily suffice to help them improve and alter their photos. Out of the box you get cropping, auto-fix, slider controls for contrast, clarity and vibrancy, a bunch of free filters, red-eye reduction and sharing functionalities. If that's not enough, you can also pony up for some extra filters and a noise-reduction feature via in-app purchase, but before you drop the cash we'd recommend taking a look at what other free (and paid) image editors are out there. All in all, though, the free tools cover most of the bases for very elementary edits.



Skyscanner

Free | Skyscanner | tinyurl.com/mdds3wh

If you're in a hurry to get somewhere and you want to be able to gauge the most competitive airline ticket prices (whether domestic or international), you won't do much better than Skyscanner. With more than 1,000 airlines and travel agents onboard to supply the flight and cost data, you get a comprehensive view of the range of travel options available to you. This Modern UI app offers a slick interface for those with set departure/return dates in mind, but if your schedule is loose, you can also easily browse the cheapest ticket windows to help make your next trip that little bit more affordable. Users of other platforms don't have to miss out either. Skyscanner has an app for almost every OS (and the web app's not half bad either).

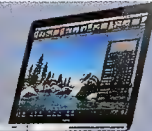


Carsales

Free | Carsales.com Ltd. | tinyurl.com/moqqad7

After several years of good service, it's finally time to sell our trusty grey Beetle (sniff). And while there's a certain temptation to expedite things and take it to a dealer, Carsales seems to be an effective (read: profitable) default for most private sellers these days. Unfortunately, the official app for Windows 8 is a buyer's market (literally); you're limited to searching or browsing through the somewhat astonishing 240,000 or so vehicles already listed, but there's no seller functionality as yet. If you're in the market to buy, however, the Carsales app makes it easy to search across all sorts of vehicle fields including make, price, location, body type, keywords and more. Updates are on the way and hopefully seller functionality gets baked in soon, but until then the web site offers a more end-to-end service.





Mac Store

APPS

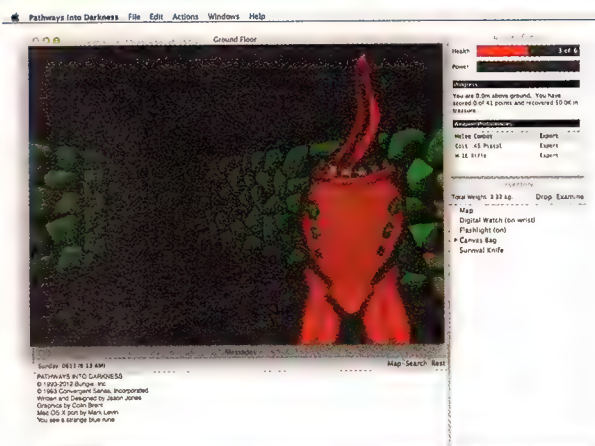
Pathways into Darkness

Get your retro on.

Free | Bungie | tinyurl.com/PathwaysMac

Cast your mind back, if you will, to a long lost age called '1993'. Before there was Xbox or PlayStation, before 32-bit Windows and before the commercialisation of the internet, computer games were simpler things then. Back then, Bungie Software released (on the Mac first!) a 3D first-person shooter called *Pathways into Darkness* which, I don't mind telling you, freaked people right the hell out.

Bungie, of course, has since been acquired by Microsoft and become synonymous with *Halo* on Xbox, so it's interesting to go back and see where it all began. *Pathways into Darkness* has been ported to OS X for the first time, with few modifications to its original interface and gameplay. OK, it's mainly one for the retro gamers and nostalgia nuts,



but it's also free, and that's a good price even if you adjust for inflation.

Gameplay is basic, movement is slow and the graphics are blocky. If you want to remember what gaming was like before the modern world arrived and messed it up with realism, download this retro game.

DocWallet

Free/\$11.49 to sync between devices | Deutsche Post | tinyurl.com/DocWalletMac

One of the perennial issues facing increasingly mobile computer users is keeping their documents synchronised between devices and keeping them safe while doing so. DocWallet, by Deutsche Post, is primarily a sort of virtual 'safe' in which you can keep sensitive documents backed up and password-protected, but its real strength is in keeping them synchronised between devices.

If you install DocWallet on your iPad, iPhone and Mac (there's also a Windows version), you can use it to

store photos, PDFs and various document types (including both Microsoft Office and Apple iWork formats) and encrypt them. For an annual fee of just \$11.49, you can also synchronise them between devices (they're also stored on Deutsche Post's servers in Germany).

The level of security is impressive, though the interface is a little confusing at first – on the iPad your DocWallet locks automatically if you leave the app, but on the Mac it stays unlocked if you go to a different application unless you manually lock it.

The inclusion of AirDrop in iOS 7 indicates Apple is aware of its users' need to share documents between devices, but it's unclear at this point how functional and secure that will be. Until then, DocWallet is a pretty solid option.

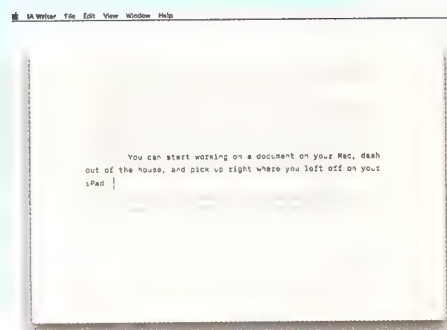


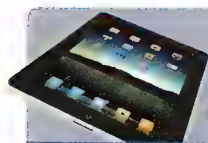
iA Writer

\$5.49 | Information Architects | tinyurl.com/iAWriterMac

iA Writer is one of my favourite writing tools on the iPad, because it provides an extra row of specialised keys on the keyboard for characters that one might need for HTML coding and so forth. But it also provides a clean, distraction-free interface with plain text and no extraneous icons. It's available for the Mac now and its interface is even cleaner (obviously, since it doesn't need an onscreen keyboard or extra symbols). Even when you're not using it in full-screen mode, unnecessary interface stuff like the border around the document with its OS X window controls disappears – it's just you and what you're writing. It also features a neat 'Focus Mode' that fades all but the sentence you're working on to grey, which is very handy if you're the type that picks up errors in your peripheral vision and can't resist going back to fix

them. It's one of the few non-Apple apps that fully supports iCloud as well, so you can start writing on your Mac, head out to catch a train and pick up right where you left off on your iPad (presuming you also have the app on your iDevice). All without having to sync or save or anything like that – very nice. It's a no-frills text editor, so if you want fancy formatting options and Microsoft Word export capabilities, it's not for you. But for just getting on with the job of writing with nothing else in the way, it's hard to pass up.





App Store | IOS APPS

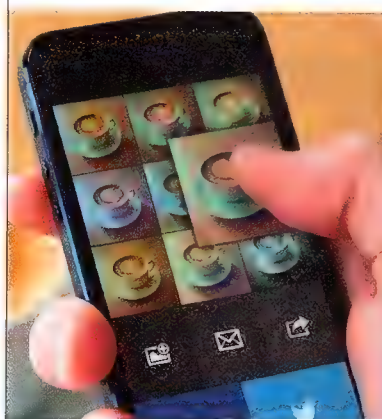
Analog Camera

Truly fair and square.

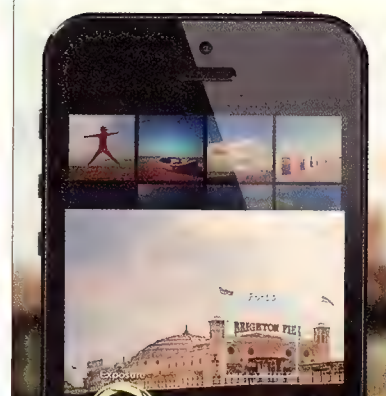
99c | Realmac Software | tinyurl.com/koupvux

We love refined designs, but honestly, how simple is too simple? That's the question Realmac Software (makers of the brilliantly streamlined Clear to-do app) have to ask themselves with their new easy-as-pie photography all-in-one app. Analog Camera is a stripped-back camera app for the Instagram generation. It takes one-tap photos in square format only, then gives you an instantaneous preview of eight filters to apply. Select one (or none), then you can save the photo, email it, or share it to other apps on your device. The invisible UI is craftily hidden and the filters are nicely subtle, but the overt minimalism and forced square ratio means perhaps only true Instagram addicts (or design fetishists) need apply.

Filters that make your photos look great!



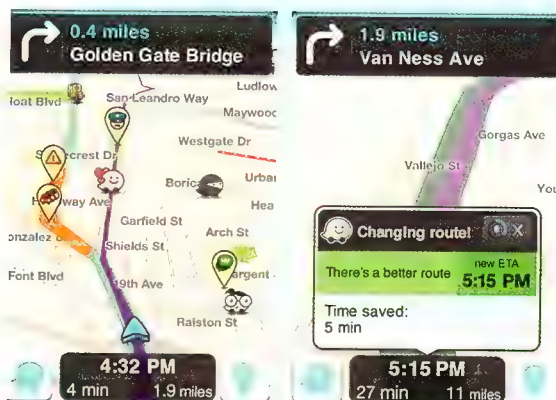
Fine-tune your shot with 3 camera modes



Waze

Free | Waze Inc. | tinyurl.com/mbqf9dw

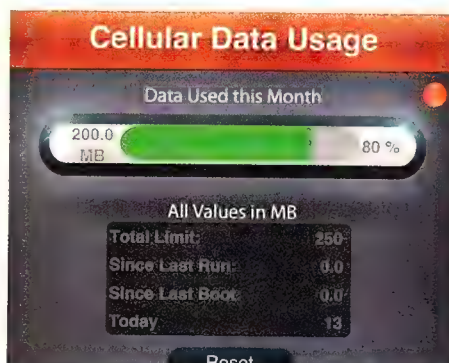
You might not have heard of 'social navigation' app Waze before, but you'll almost certainly be hearing more about it in the future. How come? Because Google just acquired the Israel-based company for a tidy US\$1.3 billion, with the aim of bolstering their own navigation efforts. Waze is a GPS-based hands-free nav app for drivers. The killer feature is every user on the road automatically uploads their driving speed and location back to Waze HQ, meaning Waze's data for real-time traffic conditions and changing routes is second to none. Throw in a bunch of fun-focused social features and you can see why Waze is a hot ticket. It's completely free for iOS and Android, so give it a try and see if you can indeed 'outsmart the traffic'.



My Data Usage Pro

99c | Webrich Software | tinyurl.com/ktfov45

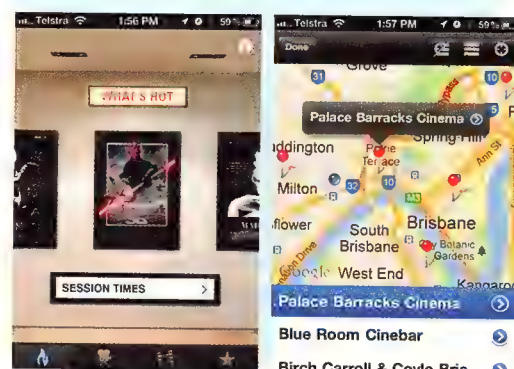
If there's one area where mobile internet still lags behind its wired, land-based cousin, it's cost. Whereas most broadband plans for the home offer almost comical value these days – the kinds of data volume that only an HD movie-loving fiend would ever run out of – the same can't be said for the humble phone plan, whether you're on a contract or prepaid plan. Penalty rates when you go over your mobile data quota vary from provider to provider, but they're never welcome or wallet-friendly, so if you don't have a data usage app, they're definitely worth considering. My Data Usage Pro is a cinch to set up, and for a measly buck it could save you a lot more in the long run (not to mention priceless peace of mind).



MyMovies for iPhone

Free | my247 and Liquid Interactive | tinyurl.com/lqjs39m

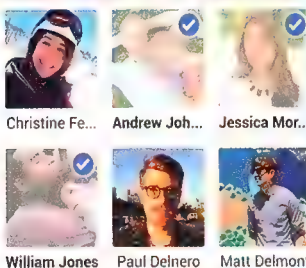
Want to see a movie? So do I. But unfortunately I'm at work. However, if I were planning on seeing a film, this app would be the first thing I'd check. MyMovies bundles together session times for literally hundreds of cinemas across Australia and comes with location services so it can point you in the direction of your nearest movie house. Plus, there's access to movie information, ratings, running times, YouTube trailers and you can even save your local haunts as your favourite cinemas. The free version sports some rather jarring display advertising but is otherwise fully functional. Basically, MyMovies for iPhone is a one-stop-shop if you're keen to escape into celluloid for a couple of hours – and it certainly beats hunting the info down on every cinema's web site individually.



Google Play | ANDROID

New Hangout

Jessica Moreno William Jones
Taco Tuesdays Andrew Johnson



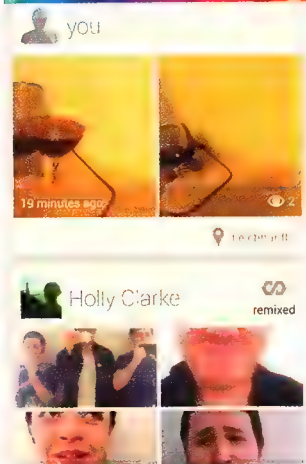
Christine Fe... Andrew Joh... Jessica Mor...
William Jones Paul Delnero Matt Delmont



Hangouts

Free | Google Inc. | tinyurl.com/o5xfno5

Messaging is clearly a big business, even when the service is provided absolutely free. Think of all the players competing in the market now: iMessage, BBM, Facebook Messenger, Skype, WhatsApp... the list goes on. And now Google has completely overhauled Talk, its instant messaging app, with Hangouts – a standalone shoot-off of Google+. Hangouts aims to be more of a proprietary WhatsApp-style text message replacement rather than an IM client, bundling in lots of group and video chat features and it very conveniently works across Android, iOS, PC and Mac. Bear in mind it's still a little rough around the edges, but give it time and Hangouts could prove extremely useful. Be warned: this will overwrite your Talk app, but you can replace Talk's IM functionality with apps like imo messenger.



Vyclone – Film together

Free | Vyclone | tinyurl.com/qbw3enj

There's a lot happening in the social video space at the moment, as the big networks like Facebook and Twitter try to hit upon what could be the next Instagram. Vyclone, which is available for Android, iOS and Windows Phone, just might have a shot at the crown. The idea is simple: you and some nearby (ie. GPS-enabled) friends all shoot video with Vyclone. Your video is uploaded and Vyclone's servers automatically edit the multiple camera angles into one contiguous short film. If you don't like the edit, you can roll up your sleeves and get manual to make your own Director's Cut of the footage. But the joy of it for most people will be seeing their mini movie assembled almost instantaneously. Should make for some big laughs at parties.



My Log Home iLWP

Free/\$2.19 paid version | 10ravens | tinyurl.com/pvvfbuh

Okay, so maybe you're stuck in the urban sprawl like the rest of us, but that doesn't mean you have to give up your lumberjack-esque dream of owning your very own log cabin. The only catch is (and it just might be a deal-breaker for some): this one is completely virtual. It gets worse, in fact. My Log Home is actually just a live Android wallpaper. But for many, this could still be the closest they come to possessing that dreamy rustic getaway in the hills. For what it's worth, this is actually a pretty nice live wallpaper, with crisp visuals, interactive elements and a comic sensibility. And at least you won't have to take out a mortgage to finance the buy. Even so, try out the free version first to see what's on offer. You wouldn't want to get post-purchase cabin fever.



Flipboard

Stop surfing and let the web come to you.

Free | Flipboard | tinyurl.com/7jbgjwm

If you haven't tried Flipboard yet, we heartily urge you to give it a go. It's probably the fanciest of the new generation of news and social readers that aim to collapse everything you could ever want to read on the web into one handy app for your smartphone or tablet. Aesthetically it's gorgeous, affecting a magazine-like layout for web content, with smooth faux 3D page turn animations as you flip through. Flipboard comes loaded with a bunch of pre-set news and entertainment sources, but it's easy and fun to find new feeds and customise the app, especially when you start adding social feeds like Facebook and Twitter. It's a real 'desert island' app (provided your desert island has a good internet connection).



Windows Store

WIN PHONE 8



because-xaviers



Beautiful Cinema - *The Curious Case of Benjamin Button*

Tumblr

The social network for 'creators' (read: hipsters).

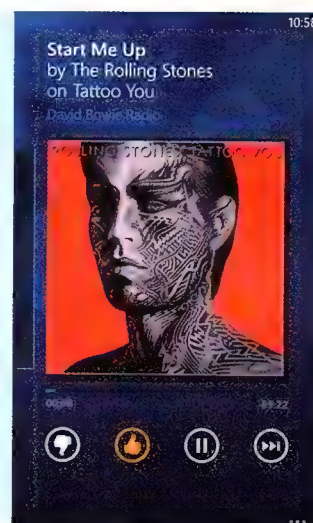
Free | Tumblr | tinyurl.com/mok9ko9

It remains to be seen just how much of an impact Yahoo!'s reported US\$1.1 billion acquisition of Tumblr has on David Karp's artsy social network, but Yahoo! CEO Marissa Mayer officially promised not to 'screw it up' when the deal was announced. One thing we're pretty sure you'll find is an increasing number of ads amongst the lolcats, as Yahoo! tries to make some money off its pricey new toy. In the meantime, this official Windows Phone 8 app, released in April, provides a nifty way for Tumblr WP8 users to get their GIF on. You can see all the blogs you follow, find more by browsing or searching and easily post your own content via one tap from the bottom of the display.

Pandora

Free | Pandora Media | tinyurl.com/owzuyj4

Australian Windows Phone 8 users are in a pretty unique (and lucky) situation when it comes to Pandora. The now-widely-imitated streaming music player – which invents radio stations based on songs and artists you like using its amusingly named 'Music Genome Project' – is only available in three countries, one of which happens to be here. But WP8 users get an added bonus over rival platforms: they can enjoy ad-free listening for the rest of 2013 due to a sponsorship arrangement with Microsoft. So, if you like free music and you're on WP8, you've got no reason not to try Pandora. Plus, there's Live Tile support and you can pin your fave stations to your 'Start' screen. Nice.



Swapchat

Free/\$1.49 paid version | SRC Apps | tinyurl.com/mxgo3m9

Compared to the utopian breadth of iTunes and Google Play, users of Windows Phone and BlackBerry continue to suffer a real shortage of apps in their respective stores. It's a quality not quantity issue primarily; not so much that there aren't enough apps, but rather the brand-name draw-cards are often missing, meaning droves of unofficial clients pop up to fill the void – but often you don't get quite the official, polished experience you might be hoping for. Swapchat is a good example. It's not Snapchat – not quite – but most of the functionality is there. To quote the developer: "Please keep in mind that this app is not supported by Snapchat and might break at any time. If it does, I'll do my best to fix it as soon as possible."

SWAPCHAT

messages

- teamsrccaps 25 seconds ago
- jncg42 about a minute ago
- jncg43 3 minutes ago, tap to download
- jncg43 5 minutes ago
- teamsnapchat 6 minutes ago

N.O.V.A.3

\$7.49 | Gameloft | tinyurl.com/gja8tzz

It's more than a little bit ironic that N.O.V.A.3 exists on the Windows Phone Store – indeed, as I write this piece, it has heavy front-page promotion – while the only Halo titles one can find are various companion apps (ie. not games in themselves). Why the irony? Because the N.O.V.A. series, as slickly produced as it might be, is an unabashed clone of Microsoft's famous FPS title. But, that doesn't mean it isn't fun (it is); in fact, it's probably the best FPS you'll find on the system. The good news for Halo die-hards, however, is that an official mobile entry is on the way soon. The recently announced *Halo: Spartan Assault* is a top-down shooter and should be launching on WP8 and Win 8 about the time you read this.





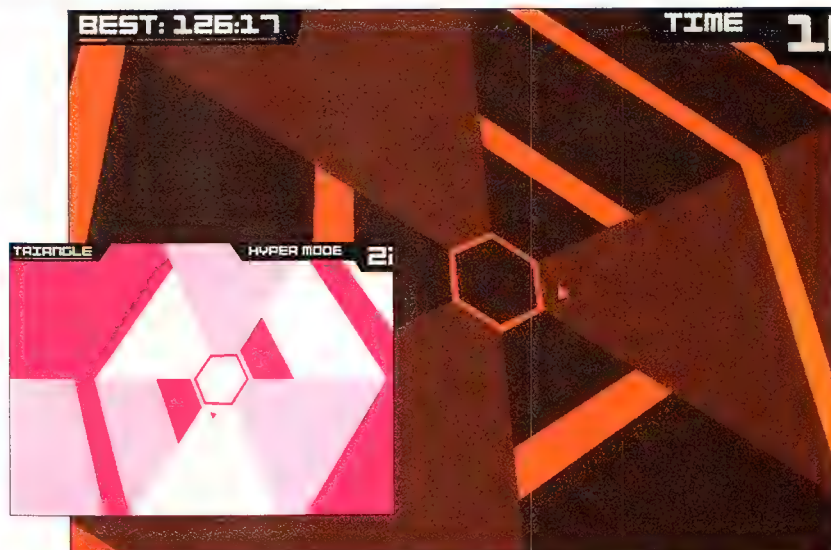
App World | BLACKBERRY

Super Hexagon

Panicky types need not apply.

\$2.99 | Distractionware Limited | tinyurl.com/ktjfbfj

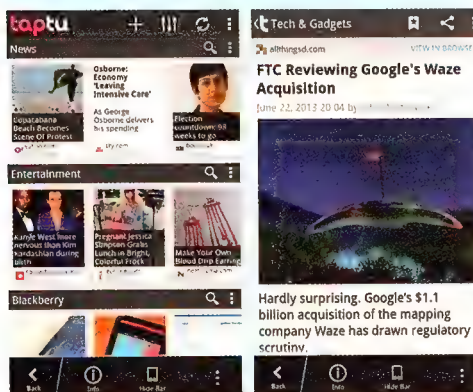
BlackBerry World's games catalogue for BB10 might still be coming along, but *Super Hexagon* is up there with the best of them – provided you like rage-inducing twitch-based arcade thrillers, that is. Kind of like *Asteroids* on speed, *Super Hexagon* charges you with piloting a small triangle (is it a spacecraft?) through a somewhat randomised maze of cascading death. There are no enemies other than the ever-closing-in walls of destruction, but the pulsing soundtrack, hypnotic visuals and relentless pace of the game have to be seen to be believed. I made my wife play it just to see her reaction – she passed the device back, totally overwhelmed by the difficulty (and perhaps even a little angry with me).



Taptu – DJ Your News

Free | Taptu Ltd | tinyurl.com/lkas6te

Just like Flipboard, Taptu is part of the recent-ish generation of news and social feed readers that want to be your one-stop portal for information relevant to you – essentially new-fangled RSS readers, but with more contemporary functionalities bolted on. Some other notables in the field include Pulse, Zite and Current, but you won't find any of these on BB10. Luckily, Taptu is here to fill the void for BlackBerry users. It's not quite as stylish as some of its competitors and can be a little laggy at times, but it's still a great way to subscribe to all sorts of news sources (or social networks, including Facebook, LinkedIn and Twitter), and you can easily share content to Pocket and Instapaper to keep for later.



Buffer

Free | Buffer | tinyurl.com/198xodl

Most people are probably quite content to share social content the old-fashioned way – you find a picture of a funny-looking animal on the internet, chuckle heartily to yourself, then link to it on Facebook, Twitter and so on. But what if you exist in the heady realm of 'power users' or digital marketers (or you're just a plain-simple shareaholic?). Buffer's here to help. If you're in the habit of posting several (or perhaps even hundreds) of social messages and links per day, Buffer can help to spread the deluge out, letting you schedule your messages throughout the day for a 'consistent social media presence'. Plus, you can access social analytics to see how many people are viewing, liking, retweeting and so forth.

Buffer is your easy way to share

Effortlessly share pins, photos, multiple profiles, & @mentions.



We share them at the best time

We schedule your pins, photos, and @mentions at the best time for your audience.



Flashlight

Free | The Jared Company | tinyurl.com/n5aenwl

When mobile company CEOs boast of the thousands (or even hundreds of thousands) of apps on offer in their app stores, what they don't tell you is that by far the majority are very humble efforts that don't do all that much. For every Evernote, there's something like this free Flashlight app. But it provides a fair degree of functionality at no cost, provided you're happy to put up with a few ads when you use it. You get a choice of brightness – a very bright rear flashlight plus a dimmer LED for when a mere glow is more appropriate – a spirit level feature, a magnifying lens (probably overkill) and the ability to take snapshots (definitely overkill, unless you're a spy). Nothing remarkable then, but a lot more useful than Evernote in the right circumstances. **APC**



Experts solve your computing problems

APC and its readers can be one giant helpdesk. If you have a technical problem, chances are one of us can solve it.

WINDOWS

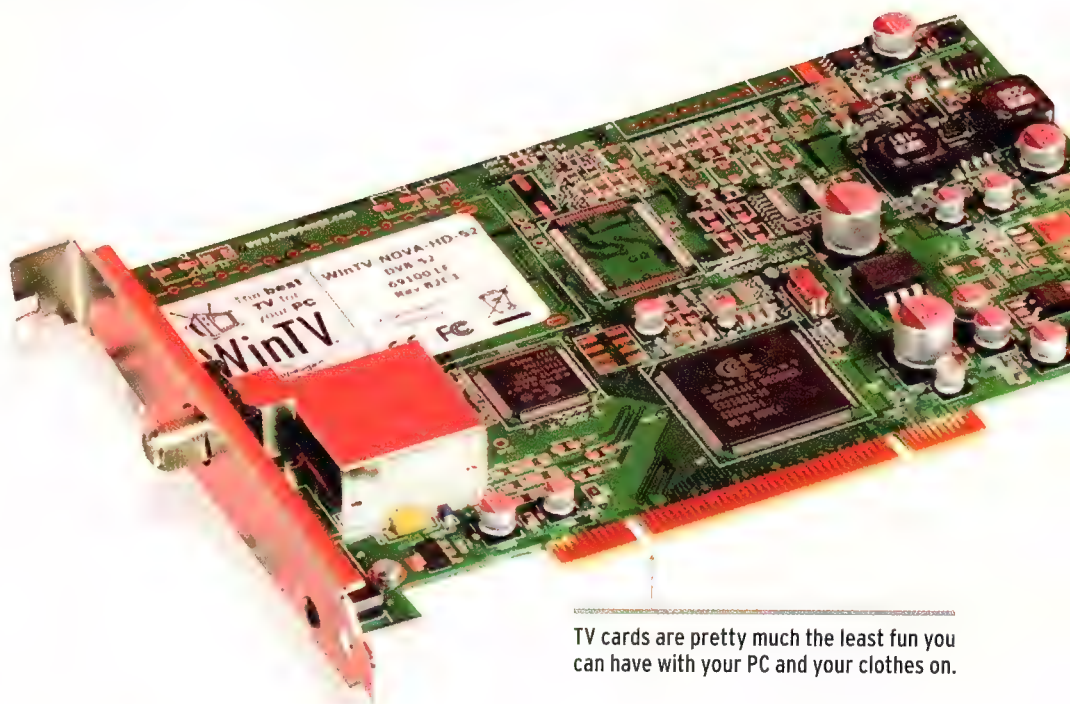
FLASHING DIALOGUES

Q When I have to open or select an item from a drop-down menu, sometimes the dialogue box will flash and the box will either close or go to the 'back' of the program I have open (usually a video editing program). This 'flashing' will also occur when I'm playing *Mahjong Titans*, one of the preinstalled Windows 7 games. Do you have any recommendations or advice?

Steve James

A We recommend you update your graphics driver before you do anything else. We haven't seen this problem for a long time, but a few years ago there was a minor spate of people complaining about flickering user interface elements, particularly drop-down menus. Of course, this was shortly after Windows 7 was released and you always get a slew of driver-related bugs when people upgrade to the new operating system, but keep their old drivers or switch to new buggy drivers. By now, all those bugs should have been firmly ironed out, unless this PC isn't connected to the internet and has never run Windows Update. That seems pretty hard to believe, but then again, you're apparently playing *Mahjong Titans* and that's even harder to believe.

Which brings us to our advice. Don't play the default games that come with Windows. It doesn't matter which version of Windows – the bundled games are always the worst use of your time. That was true even in 1990, when all we had was Windows 3.1 and installing proper games in DOS was much harder because you had to know about hardware IRQs and I/O addresses. In 2013, it's literally unforgivable. Find a better game that you enjoy more and play that instead.



TV cards are pretty much the least fun you can have with your PC and your clothes on.

HARDWARE

IMAGES, BUT NO SOUND

Q I installed a TV tuner card in my PC. I can view whatever I connect to, but the problem is that when I record, I find I've only got images without sound. The TV card's brand name is Dany.

Maabadi Marquis

A Ah, the TV tuner card. What a quaint device. We're always surprised when we come across someone still using one. They're like that other 1990s gizmo, the fax machine. Who could have predicted back then that the internet would one day be fast enough to replace both of these things?

Anyway, the Dany T.View still exists for those who want to watch analogue television on their PC. Accidentally recording TV without sound is a pretty common symptom, if the company's support forum is to be believed. It's usually caused by either driver problems or incorrect audio output selection. First, you should try uninstalling the Dany drivers and

the drivers for your sound card. Reinstall the TV card drivers first and then install the sound card drivers.

If that doesn't help, check whether you have sound coming from the headphone jack on your sound card or the built-in jack on the motherboard. If the TV audio doesn't come out of that jack and only comes out of the headphone jack on the Dany TV card itself, you could try running a phono-to-phono cable from the headphone jack on your TV card to the microphone jack on your sound card/motherboard instead.

NETWORKING

NO WI-FI

Q I've just bought a new gaming rig and now I'm trying to connect it to my wireless router. When I click on the Wi-Fi 'staircase' icon on the taskbar, it keeps asking me to enter my username and password. I've tried entering the router admin password, but that doesn't seem to work. Help!

Jade Greenall

A Are you absolutely sure that your PC includes a Wi-Fi card? Even some high-end systems don't include a Wi-Fi card in their default configuration. Have a good look at your order receipt – can you see any mention of a Wi-Fi card there?

'10/100/1000Mbps Ethernet' means a wired network connection, not a wireless one. Now take a good look at the back of the PC. Do you see any black plastic-coated aerials about the size of a pencil sticking out? If you draw a blank there as well, then it's pretty much conclusive.

Don't worry though. A Wi-Fi card is fairly cheap to add and easy to fit. Try the TP Link TL-WDN3800, for example. Once you've plugged it into a spare socket (for preference, choose the one furthest from your graphics card to minimise interference), Windows should autodetect it and prompt for drivers. If you have Windows 7, install the drivers on the disc. Windows 8 isn't compatible with the drivers currently shipping, but the built-in Windows 8 drivers work perfectly well, so just go with those.

SOFTWARE

NOTHING TO SEE HERE

Q I need to erase a few files on my hard drive so they are totally unrecoverable. Can you recommend software?

Name Withheld

A First of all, we remind you that if you're currently under investigation it is a crime to destroy evidence, so don't do it. The tool Eraser (eraser.heidi.ie) can overwrite files, folders and whole drives with random data so their contents are totally unrecoverable. Use with caution.

HARDWARE

SLOW SSD

Q I installed an OCZ Vertex 4 512GB and I am getting slow read/write speeds – about 50% of the rated speeds. I have a Gigabyte GA-X58A-UD3R (rev. 2.0) motherboard, an Intel Core i7-970 CPU and 24GB of Kingston DDR3 1,600MHz. I am using a SATA 6Gbps connection in AHCI mode. I also used IDE mode, with the same results. Can you tell me how to get the rated speeds?

James Capolupo

A Good news and bad news, James. Bad news first: you can't. The X58 chipset hails from a time before Intel had its own native SATA 6Gbps controllers and the Marvell SE9128 chipset your board uses just isn't as fast as the native Intel chipset, which is what everyone bases their performance numbers on.

The good news is that it doesn't really matter. Your rig is plenty fast and your SSD isn't going to be slowing you down anytime soon. The big boost an SSD provides is the quick random-access times – the fast sequential read/write speeds are a bonus. You're still seeing faster reads/writes than on any hard drive and even most SSDs. Don't let the difference between the rated and actual speeds get you down.

STORAGE

WHERE HAS MY DISK GONE?

Q I built my PC a year ago and occasionally I encounter a BSOD, accompanied by a restart. When the system loads, the message 'BOOTMGR is not available' appears. If I restart, the message stays. I have found that unplugging the SATA cable and plugging it back in gets rid of the message, albeit temporarily.

Stevan Holt

A BOOTMGR errors are normally caused by a corrupted boot sector on the disk. The interesting question is why re-plugging the SATA cable would fix that.

From the hardware specification you supplied, we can see that you have a 60GB SSD as your boot drive and a 1TB hard disk for storage. Our guess is that your PC is trying to boot from the hard disk instead of the SSD and can't find the boot manager because this disk isn't configured as a bootable drive. This might be because the SSD isn't getting detected at boot time. Unplugging and plugging is somehow waking up the SSD so it takes its proper place as the boot device.

That's a tidy little hypothesis there, but how do we translate it into actual troubleshooting? Start by booting from the Windows 7

installation DVD. After you've selected your language, time, currency and keyboard, click 'Repair your computer'. On the 'System Recovery Options' dialogue, run the 'Windows Memory Diagnostic' first. Bad RAM can cause all kinds of weird behaviour (including the BSODs), especially if the RAM was bad when you installed Windows. If the RAM checks out, try disconnecting the hard disk and running the 'Startup Repair' option in 'System Recovery Options'. If that doesn't help, try the 'Command Prompt' option and type `bootrec /rebuildbcd` at the prompt. Then replace the SATA cable to the SSD and if that doesn't help, replace the SSD itself.

If none of these things work, you should next swap the motherboard, the PC, both kidneys, the left side of your brain and the whole of your perceived reality for a universe in which Windows boots correctly. **BUC**

Storage errors can be tricky to track down – be prepared to swap everything, including body parts.



APCMAG@BAUER-MEDIA.COM.AU Share your tech tips

Have you solved a tech problem or found a better way of doing things with your computer? Share your information with other APC readers by sending it in as a tip to apcmag@bauer-media.com.au, along with your

name and contact details (details won't be printed). Alternatively, if you have a technical question post it online on our forums at apcmag.com/forums and other readers may be able to solve it.

Hack your Nvidia BIOS

Ashton Mills shows you how to tweak the performance and sound profile of your card to taste.

YOU'LL NEED THIS

KEPLER BIOS TWEAKER

Head to tinyurl.com/ld2ssw4 to download this tweaker.

NVFLASH

The firmware update utility is available from tinyurl.com/I54txmf.

PATIENCE!

Tread carefully.

When software tweaks aren't enough you can sometimes take it a step further and delve into the hardware side. Overclocking falls into this category, although technically in many ways this is a form of software tweaking as well via user-exposed timing parameters.

But when they won't do you can go right to the source – the BIOS or firmware itself. Most devices have a BIOS or firmware in some form, from your motherboard and network card to your hard drive and, of course, graphics card.

Usually modifying a BIOS provides access to features not possible through software, but the downside is that as the BIOS is the very first piece of software an equipment loads long before it interfaces with Windows, it's entirely possible to brick your hardware (that is, make it inoperable).

Now, why would you want to start fiddling around with your graphics card's BIOS then? Because you can of course! That, and there are some very useful reasons to do so.

WHY BIOS EDITING?

Beyond being able to precisely tailor the performance of a card to your liking, in more general terms BIOS editing provides the following advantages:

- Fixing known good overclock values such that you don't need to run software at boot up in Windows to set them. This also means being able to have overclocked cards in Linux when equivalent overclocking tools aren't available.
- Changing values not possible with software, such as fan control ranges and power values.

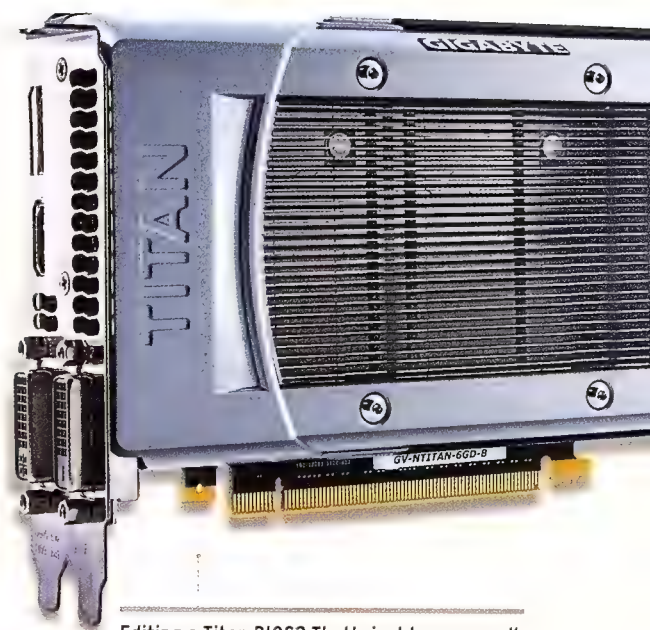
This not only enables you to squeeze more performance out of a card, but also to tailor it for other roles, such as reducing clock speed and fan control ranges to create a lower-power, and substantially quieter card. It all depends on what duties you want to tailor the card to perform.

NVIDIA AND AMD

Before we begin, first note that this guide is aimed at Nvidia cards. It's possible to also edit and flash AMD cards, though

HERE BE DRAGONS!

Flashing the BIOS of any piece of kit, be it your motherboard, SSD, or graphics card could always end in tears. If the power should go during a flash, you're usually fubared, but beyond this the most common cause of bricking hardware is flashing the *wrong* BIOS for your gear. Fortunately, what we're going to recommend here is editing and flashing your graphics card's current BIOS. However, this doesn't guarantee it's safe. Life happens, so we provide no support should you damage your hardware following this guide.



Editing a Titan BIOS? That's just how you roll.

the most popular BIOS editor for AMD GPUs is a little out of date and doesn't support 7XXX series cards. Still, see www.techpowerup.com/rbe/ for more information.

Secondly, the editing tool covered here pertains to Kepler-generation Nvidia cards – that is, GeForce 600- and 700-series (including Titan). A different tool is required to edit earlier Nvidia GPU cards (500 series and earlier) that goes by the name Nibitor – see tinyurl.com/I98ot6v to download. The principles between the tools remain the same, however, and you can still use NVFlash to flash a BIOS on 500 series and earlier cards.

BACKUP YOUR BIOS

The first step, as always, is to make a backup of your current BIOS. Should anything go wrong, you can then flash your original BIOS back to your card. To backup, first call up a command prompt ('Run > cmd.exe' in Windows 7, or simply right-click in the lower-right in Windows 8 and select 'Command Prompt'), change to the directory where you unzipped NVFlash (eg 'cd c:\nvflash') and run the following:

```
nvflash.exe --save original.rom
```

NVFlash will detect the cards in your system and, if you have more than one, prompt for which card's BIOS you want to save.

EDITING YOUR BIOS

Start the Kepler BIOS Editor and click on 'Open BIOS', then select the '.rom' file you just made with NVFlash.

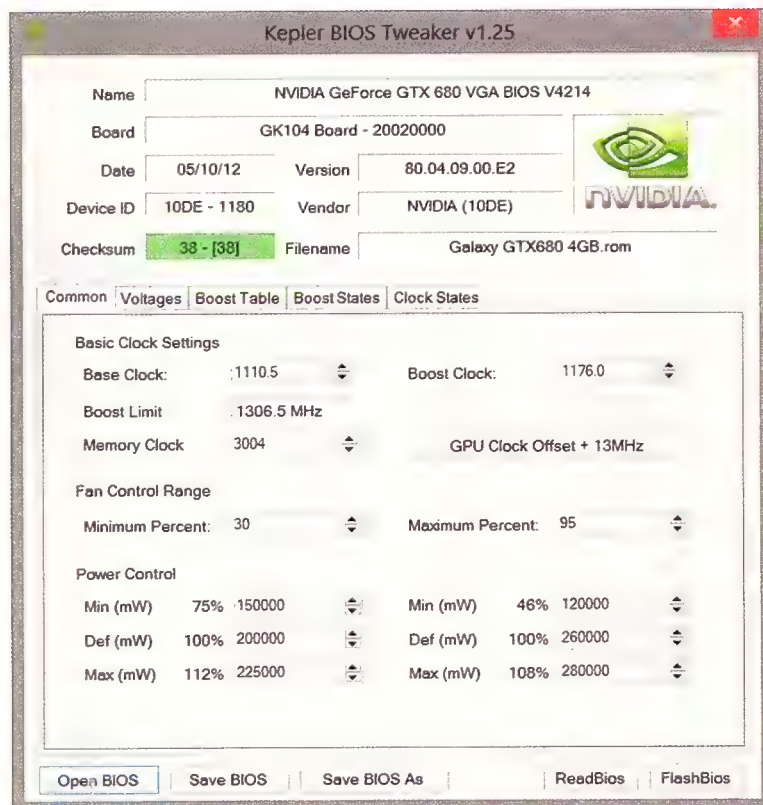
What you can do from here depends on what card you have. For example, on a GTX 680 you will have access to all the tabs, while on the lower-end GT 640 only some features may be editable. In most cases you can always change clock speeds, fan speeds and power draw.

WHEN THE SHIZ HITS THE FAN

What to do in the event you've bricked your card? (aka, the screen is black and nothing is happening!). After screaming 'KHAAAAANNNNN!!!' while shaking a fist, relax and realise there's every chance you can recover your card.

This is much easier if you already have multiple cards, either from an SLI setup or if you have an integrated GPU (such as with the more recent Intel CPUs) that you can use to boot your system. In a similar vein, if you have an older video card lying around or can borrow one, you can put this in your system and hook the monitor up to it in order to boot back into Windows. That's really the hardest part, simply getting a screen back up and running. Alternatively, for example, you can put your bricked card into another PC as a secondary card.

Once you're able to launch a Command Prompt again in Windows, recovering your card is simply a matter of flashing the original BIOS. However, first be sure to run `nvflash.exe --list` to ensure you identify the correct index number for your card now that you have more than one card in the system, and then flash it using that index number (for example `nvflash.exe --index=1 -5 -6 original.rom`).



Easily set Base and Boost clock speeds here.

PERFORMANCE

Kepler GPUs operate within a power envelope that dictates a base and boost clock the card can achieve. By default it's often conservative to take into account the different platforms and temperatures a card may be exposed to. However, you can usually add another 100MHz or so to the Base Clock and Boost Clock and get more performance for free in return for slightly higher temperatures under load.

It's a good idea to first find your card's limits using a tool like Nvidia Inspector (tinyurl.com/agxm64t) to overclock the card via software first, testing with demanding games and benchmarks to find your GPU's limit, and then lowering it a little. You can then fix these as default in the BIOS.

To do this, the best way is as follows:

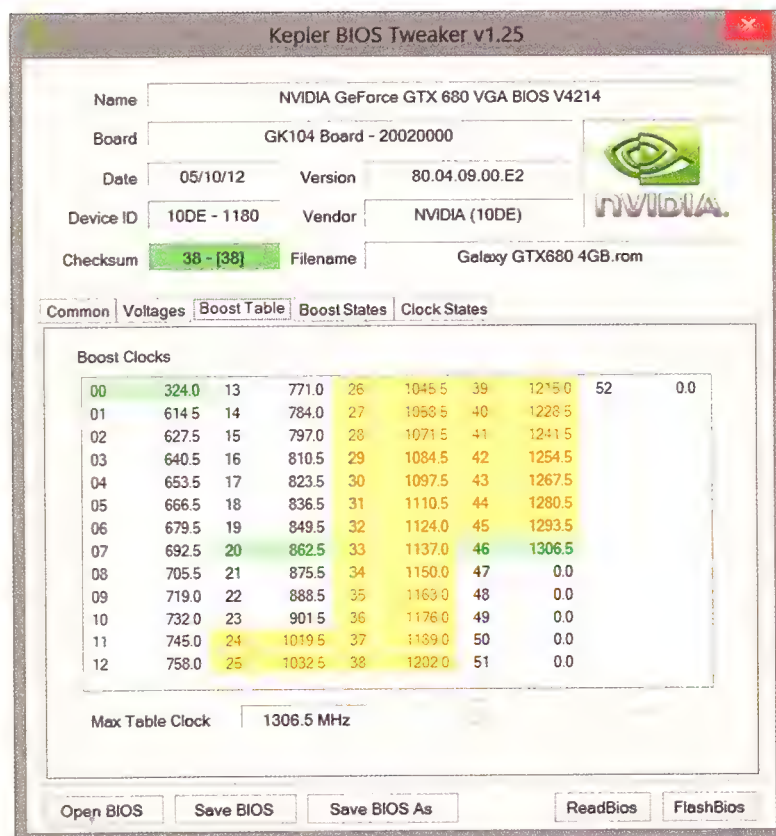
- Click 'CPU Clock Offset +13MHz' to raise both Base and Boost clocks to your preferred limit.
- Click on the 'Boost Table' tab and note the 'Max Table Clock' at the bottom, but don't adjust it (the 'CPU Clock Offset +13MHz' raised this for you already).
- Back under the 'Common' tab, use the slider to raise the 'Boost limit' to this value.

And that's it. For memory clock you can also increase it, as with the base clock, to a known good limit you should find with testing. Usually, most cards can handle at least another 100-200MHz.

POWER

On the whole, we don't recommend playing with increasing power profiles. You can increase voltage under the 'Voltages' tab, which will provide greater headroom for higher core clocks, and then raise the mW values under the 'Power Control' field for Def' (Default) but doing so will create more heat and may unduly stress the card. It's possible to permanently damage your card with excessive voltages. However, extreme overclockers with water-cooled cards can find more headroom this way.

Decreasing, however, is another matter. For noisy cards with whiny fans and especially for cards destined for HTPC boxes, you can create



The Boost table shows the clock rates the card will use when boosting.



Voltages can be changed as well, though you should be more careful here.

a quieter idle card by lowering all of voltage, clock, and fan speed. For example, an HTPC would do well with a compact GT640, but even while idle it can be quite noisy.

MINIMISING NOISE

If you find your card's fans a bit noisy, you can set the minimum and maximum fan control range. Before doing this, monitor your card's fan speeds while under load (for example, again by using Nvidia Inspector). If the fans are already going full ball and temps are exceeding 80°C, you don't want to lower the maximum.

However, minimum fan speeds can often be lowered without issue, though again, keep an eye on your cards while idle to see how hot they get. Generally, coolers for higher-end Kepler-based cards are practically silent while idle, but the same is not true for some of the lower-end cards. Lowering minimum fan speed from 30% to 10% can make a world of difference, while increasing idle temps only slightly.

Again, this is ideal for those GPUs serving duty in HTPC boxes where you'd rather not hear the fan unless you absolutely needed to.

Note that each card has its own fan curve that tells it when to ramp up the fan speed based on temperature. Kepler BIOS Tweaker unfortunately doesn't expose this, and while the curve will operate within the bounds of the new minimum and maximum values you set, if you want more control use a program like EVGA Precision (www.evga.com/precision) to create your own fan curve. This should be done with the enclosure in which the card sits in mind – for example, a desktop case may have better airflow than an HTPC case, so build a curve that best suits the workload and cooling environment for the card.

Finally, note that there are two more tabs to consider: 'Boost States' and 'Clock States'. These expose some of the raw values that set clock and boost states of the card. If you're raising the clock, these will be adjusted automatically so there's little reason to touch these. If you're looking for a quieter idle card, however, you'll find you can lower the standard Kepler base clock of 324MHz by using these tabs. If you do this, make sure to leave the P00 states alone; these represent the performance mode of your card under load. Instead, edit the P8 states



An EVGA GT 640 card. Good for an HTPC, but has a noisy fan. Lowering fan control range, voltage and clock creates a quieter idle card.



Use a tool like Nvidia Inspector to first find your overclocking headroom.

and start by simply halving the 'min' values. A lower clock draws less power, which generates less heat and allows for a slower and thus quieter fan. You can also then lower the P8 voltage under the 'Voltages' tab for further reductions.

Generally, we don't recommend doing this for high-end Kepler cards like the 670 and 680 series. This is more an option for the lower end of the series and for those cards which may be idle in HTPC boxes where a quieter fan is appreciated.

FLASHING YOUR BIOS

Once you've finished making your tweaks, click 'Save BIOS as' to create a new file (don't overwrite your original one!). Give it a new name and flash it like so:

- First off, determine which card you want to flash if you have more than one. Run the command `nvflash.exe --list` to show all detected GPUs in your system.
- Flash the card with: `nvflash.exe --index=0 new_BIOS.rom`. Where 'index' matches the card number is where you want to flash provided by the `--list` command. For a single-card system this will almost always be 0.

USING BIOSs FROM OTHER CARDS

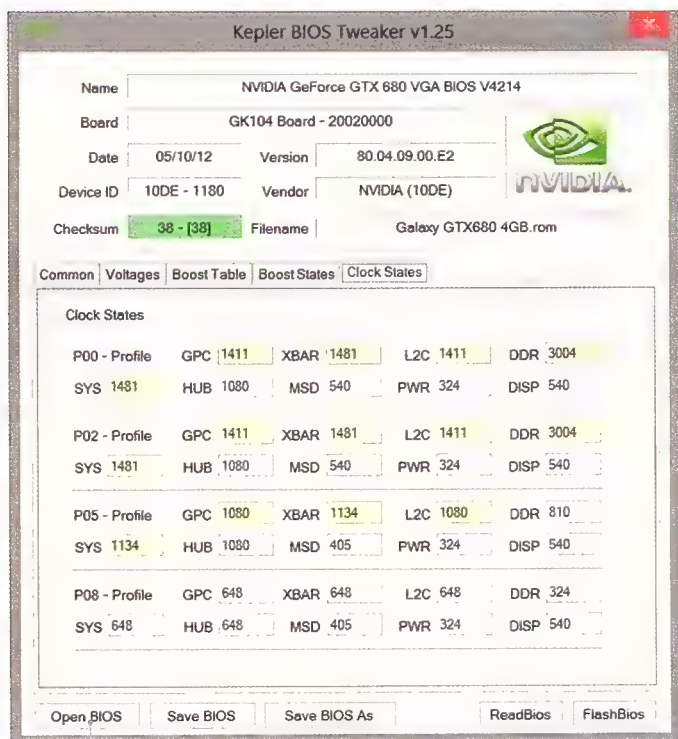
Inevitably, most manufacturers make their own tweaks to their products. Sometimes this includes using different base and boost clocks as well as fan speed curves and power profiles. Rather than editing and flashing your own BIOS, you can simply flash the BIOS from another manufacturer, just as long as it matches your model and onboard RAM *precisely*. If you flash the BIOS for one model of card on another (for example, a GTX 680 on a GTX 670), chances are very high that you'll brick the card. However, you can, for example, flash an

EVGA GTX 680 on a Galaxy GTX 680, but you've just got to be sure to get one that matches your VRAM exactly as well (e.g. don't use a 2GB GTX 680 image on a 4GB GTX 680).

If nothing else, downloading BIOSs for other cards can be a great way to compare and learn from them (seeing, for example, how a higher Base clock and Boost clock is achieved on that model, or what ancillary settings in the 'Boost States' and 'Clock States' tabs are used). You can then edit your own card's BIOS utilising what you've learned from

another. This is often a better way of doing things given, as mentioned earlier, that cards have their own fan curve profiles which will usually match the type of cooler attached (as some manufacturers replace the stock Nvidia one with their own design) and which isn't exposed in the Kepler BIOS Tweaker.

A great place to find other BIOSs is the web site **techpowerup.com** which keeps a database of BIOSs submitted using the popular GPU-Z tool. Head over to **www.techpowerup.com/vgabios/** to browse further.



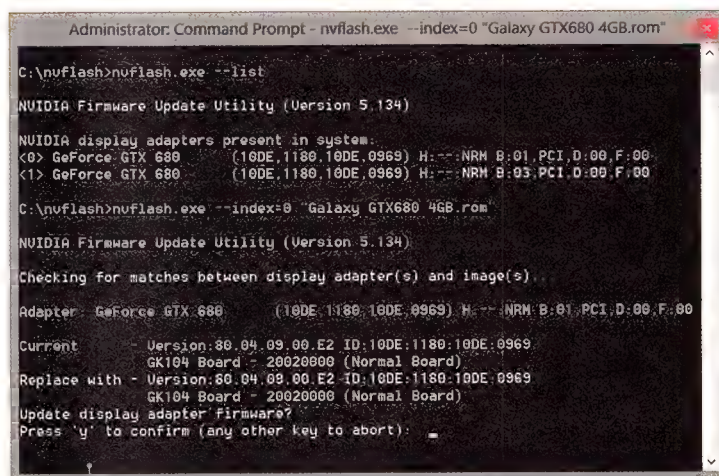
The Boost and Clock states provide fine-grain control over clock speeds, however these can usually be left alone.

If you're playing around with flashing the BIOS of another manufacturer (after checking it matches your model and VRAM exactly), NVFlash will report that the BIOS and the destination card do not match. It does this as it checks the Device ID and version embedded in the BIOS. However, you can override this behaviour by flashing with this command:

```
nvflash.exe --index=0 -5 -6 new_BIOS.rom
```

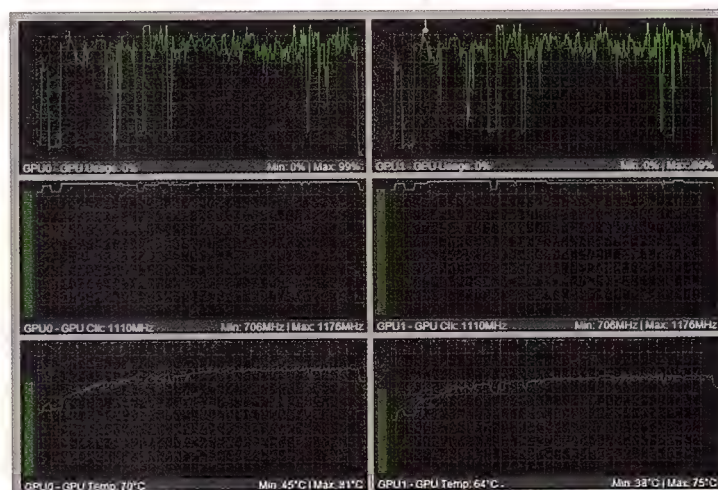
Again, as per the 'Using BIOSs from other cards' box above, this is something to do carefully, making sure the new BIOS is an exact match for the make, model and memory size of your current card. When you do this, it's usually not a problem to try out different BIOSs this way, and can be a quick way to use the BIOS of a higher-clocked card on yours as a means to overclock it. However, we'd still recommend a better route to be downloading the BIOS from another card and looking at it in the Kepler BIOS Tweaker, then using the values you see to edit your own BIOS and flash this.

Finally, close everything down and reboot before you do anything else. Note that, if you flashed the BIOS of another vendor, your drivers will think a new card has been installed and so you may need to go



Flashing the BIOS is easy with Nvidia's NVFlash tool.

Use Nvidia Inspector to visualise clock speeds, temperature and fan duty cycles to measure the results.



through the driver installation process again (either let Windows handle it, or manually install the latest drivers to be sure).

Then, open up Nvidia Inspector or a similar tool where you can monitor temperature, fan speed and of course clocks, and throw some games and benchmarks at your system. Monitor the card carefully and make sure it's operating fine and temperatures are staying below 80°C. If you're happy with the clocks, the temperature and the noise profile from the fans, then congratulations on successfully BIOS editing your card! **BTFC**

Mail to the masses

For some reason, Apple still hasn't built the ability to send email to groups in iOS. **Matthew J.C. Powell** has some workarounds.

YOU'LL NEED THIS

MAILSHOT

This \$4.49 app allows you to create groups and integrates with the iOS Contacts app. You can download it from tinyurl.com/kc62ted.

Every time there's a major update to iOS, I have my wishlist of features I want to see – you're probably the same yourself. Particularly when it comes to Mail, I've had disappointments in among the triumphs. (I used to be a BlackBerry user and thought Apple might not take quite this long to catch up.)

iOS 7, shown off at the Worldwide Developers Conference and coming in a couple of months, ticks a few more items off my Mail wishlist, but still leaves my major bugbear: support for groups. On the Mac, you can create a 'Group' in Contacts and simply by typing the name of the group in the 'To:' field of a Mail message, send a message to everyone in it. On the iPhone and iPad, your Contacts app retains the groups you create on the Mac, but typing the group name into a Mail message does nothing. You can't create groups on iOS devices either – it's kind of a mystery why the feature's there at all, really.

Even Bento for iPad, the simple database manager created by Apple subsidiary FileMaker, supports groups and lets you create them as well as add contacts to groups, but doesn't go the next step and let you send a message to a group – very frustrating.

Until Apple fixes iOS's Mail app properly to support groups, you're either stuck using your desktop computer for group emails, or you can work around the limitation. We'll show you two ways to do it: one that's free and one that costs a little.

THE FREE WAY

When you type the name of a group into OS X's Mail app, you'll see the addresses appear, separated by commas. Just as if you type a single contact's name, their address appears, appropriately formatted.

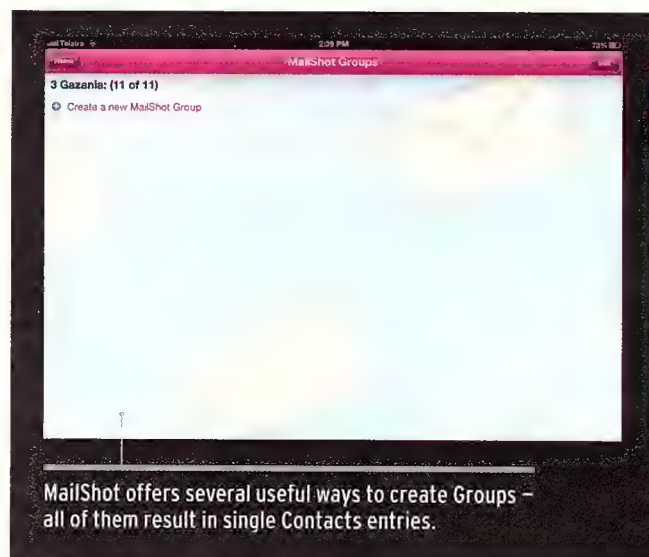
The key to this trick is knowing that the email address fields in iOS's Contacts app can contain multiple addresses, separated by commas. It's possible that this is actually a bug, since it's not actually possible to enter two addresses separated by commas into the fields in Contacts. However, you can trick it into accepting them.

First, open up a plain text editor, such as your Notes app, and type in a name for the group you want to create – this will end up being the name of the note, so you can find it again later. Then, on a separate line, type the addresses you want in a group (or copy and paste them) into one line. It's important that they follow the format Name<address@server.com>,Name<address@server.com> and so on – no spaces between, only commas, and don't forget the angle brackets. Once you have the addresses you want to group together in your note, tap on them and then 'Select All > Copy'.

Next, go to your Contacts app and create a new contact. Give it a name that will be quick to type and which will remind you what the group is, although we don't recommend giving it the same name as any actual groups you've got in your Contacts. If Apple ever does fix this thing, you don't want to cause confusion.

Tap in the email address field and paste the addresses you copied from Notes into it. As you can see, there are commas there and everything, though you wouldn't have been able to add them manually. Tap 'Done' to save your new 'contact'.

Finally, go to Mail and tap the 'Compose' button to create a new message. Type the name you gave the group you just created and tap 'Return'. You'll notice that unlike in OS X Mail,

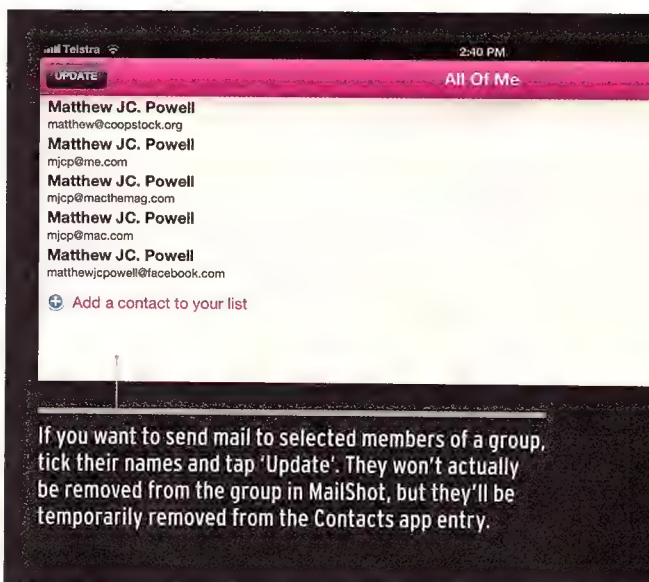


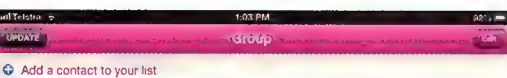
the individual addresses aren't separated. That's because unlike a 'real' group, iOS is seeing this as one contact with one long address. Don't worry, though – when you hit the 'Send' button, the mail server will interpret the comma-separated addresses correctly.

The downside of doing things this way is that it's fairly laborious to add or remove people from the 'group'. In order to do so, you have to go back to the note you created, add or remove names, ensuring no spaces creep in, and then select, copy and paste them into the email address field of the contact you created, replacing the old address. There has to be an easier way.

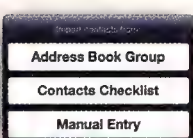
THE CHEAP WAY

There happens to be an app called MailShot (tinyurl.com/

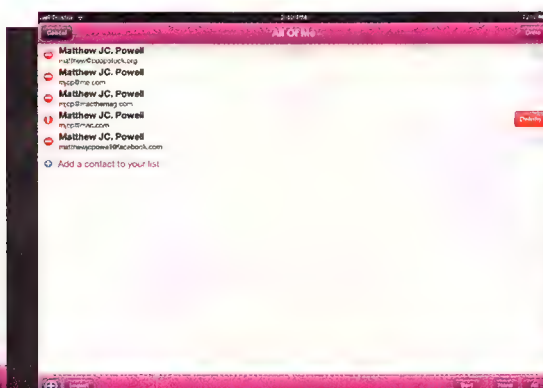




When you tap 'Update' in MailShot, it performs all the manual copying and pasting into the Contacts app. You have to do this every time you make a change.



MailShot allows you to import all the addresses you have in a 'real' Contacts group and add them at once to a MailShot group, which the Contacts app sees as one contact with a really long address.



Delete MailShot groups using the 'Edit' screen. Since MailShot groups are really just single contacts, you can also delete them using the Contacts app.



Avoid giving your MailShot groups the same names as 'real' Contacts app groups.

kc62ted), which essentially exploits exactly this same little trick, but does so very elegantly and with proper integration with the iOS Contacts app. If you only need to create groups of five or fewer addresses, it's even free – more than that costs \$4.49 for the Pro version.

When you start MailShot, you'll be presented with the app's 'Home' screen, which isn't much use to you. Tap on 'Start' to get to the meat of it. That takes you to the 'MailShot Groups' screen, where you have two options: 'Create a group' or 'Edit your existing groups'.

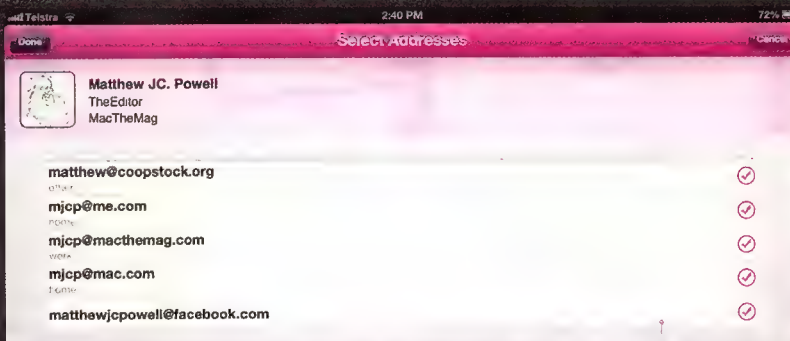
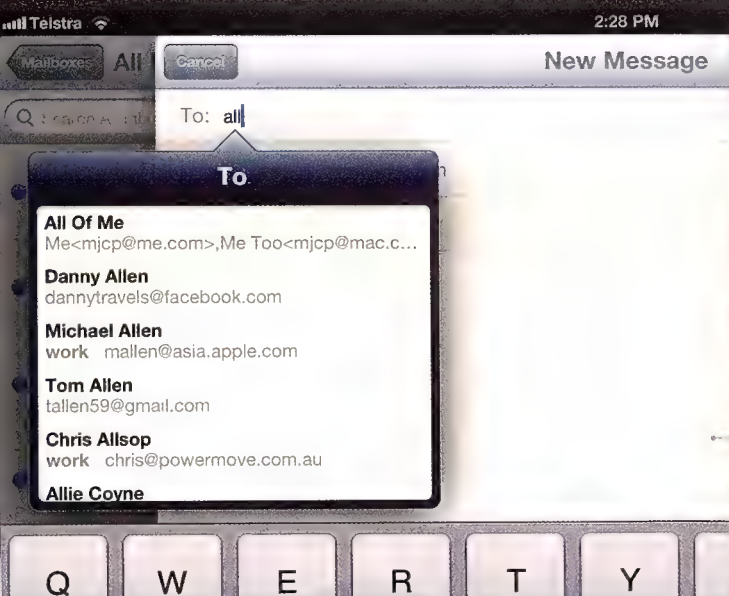
When you create a group, you first give it a name and then tap 'Done'. Here's the neat part. In the group creation screen, tap on the 'Import' button down the bottom and you'll be given the option to import addresses from groups you've already got in your Contacts app. If you wish, you can also add names manually, or even type in names and addresses that aren't in your Contacts app if you need to.

Once you have all the names you need in your newly created group,

tap the 'Update' button in the upper-left corner of the screen. This essentially performs the same function as the copy/paste operation described above – it creates a contact with the name of your group (and puts 'MailShot Group' in the 'Company' field), with all of the addresses grouped together and comma-separated in the address field.

To add or remove people from a group, go back into MailShot, tap 'Start' and then tap on the name of the group you want to edit. All the names will appear with tick marks next to them. Either tap the (+) symbol to add a new contact to the group or tap the tick next to a name to deselect it if you wish to remove someone from the group. When you're done, don't forget to tap the 'Update' button so that the 'group' (which is really just a contact in your Contacts app) is updated correctly.

At some point Apple will (hopefully) fix its somewhat neglected Contacts app on iOS. Until then, these handy little workarounds make it considerably more useful as a productivity tool. [ABC](#)



Whether you've created a group manually or with MailShot, typing its name in the 'To:' (or 'Cc:' or 'Bcc:') field will add all of the addresses. Unlike a 'real' group, though, the addresses won't be separated – iOS sees only one contact.

If a contact has multiple addresses, MailShot lets you select which address to add to the group quite easily.

Making space redux

Last month **Matthew J.C. Powell** showed how you could reclaim some of your Mac's hard drive space in an emergency. This time round, a few hints for gaining a lot of space and keeping it.

YOU'LL NEED THIS

MONOLINGUAL

Download this free program from monolingual.sourceforge.net.

Mac OS X comes equipped for use in many languages, but Monolingual lets you delete all but the ones you actually use on a regular basis.

You don't have enough hard drive space. No point arguing – it's just a fact (also, this is a magazine, so you look silly arguing with it). We don't have enough hard drive space either and we've got scads of the stuff. No matter how much we get, it seems, we need more.

Last month we showed you how to reclaim some emergency space to get yourself out of trouble when the 'Disk Almost Full' message showed up. For longer-term space savings, a more extensive approach is needed.

Of course, one great thing to do is go through your 'Applications' folder and get rid of any programs you don't use. If you're the kind of person who can do that, you have our respect. We're not. As soon as we see an application we haven't used since the day we downloaded it, we're immediately reminded of why we got it in the first place and can't bear to part with it.

Pro tip: if you delete iDVD or GarageBand because you don't need them, you should also go into 'Macintosh HD/Library/Application Support' and remove the 'GarageBand' and 'iDVD' folders. That's where the loops, themes and so forth for those two applications reside and they can be huge.

If you've taken the steps described last issue and also deleted unwanted applications, it's time to bring out the big guns.

- **Get Monolingual.** Apple is a global company and OS X is a global operating system. The Mac on your desk contains the resources to be used in any of several hundred different languages at any time. It's awesome. However, you probably don't use hundreds of different languages. Most likely, you use one or maybe as many as three or four if you're a clever polyglot. But not hundreds.

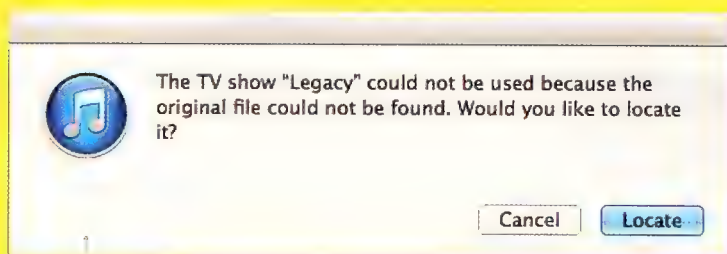
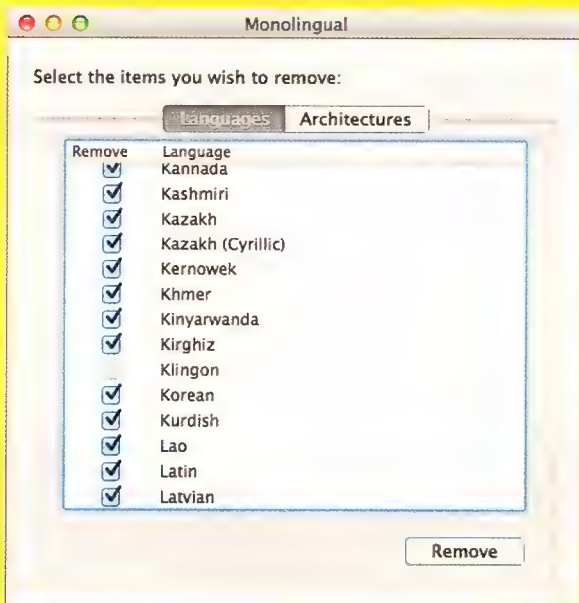
You can get rid of those extra languages. Unfortunately,

it's not easy to do so without knowing exactly what you're doing. Fortunately, someone who knows exactly what they're doing has written a pure genius utility called Monolingual that removes all the unwanted language resources on your Mac – not only in the OS itself, but also in applications such as Microsoft Office and Adobe Creative Suite, which are also designed to work worldwide. Download it from monolingual.sourceforge.net, tick the languages you don't use, enter a password and let it do its thing. A few minutes later you'll have gained a leaner Mac.

Ah, but that's not all. As well as all those languages, OS X contains code tailored for whatever architecture of Mac you've installed it on – PowerPC, Intel, 32-bit, 64-bit and so on. Likewise, rather than creating separate versions of their applications for PowerPC or Intel, developers have long distributed 'fat binaries' containing code designed for both platforms. The computer just runs the bits it needs and ignores the bits it doesn't.

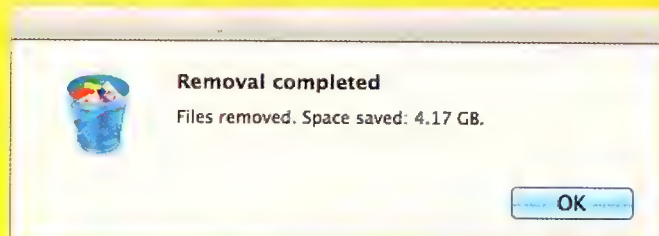
But you don't need those bits taking up your precious hard drive space, do you? It's possible that if you're running the very latest Mountain Lion on a 64-bit Intel iMac, you've got code bouncing about there that was written for PowerPC G3s back in 1998. Similarly, if you're still trying to wring the last drops of value out of your PowerPC G5 (for which, kudos my friend) you don't need code for 64-bit Intel iMacs robbing you of storage.

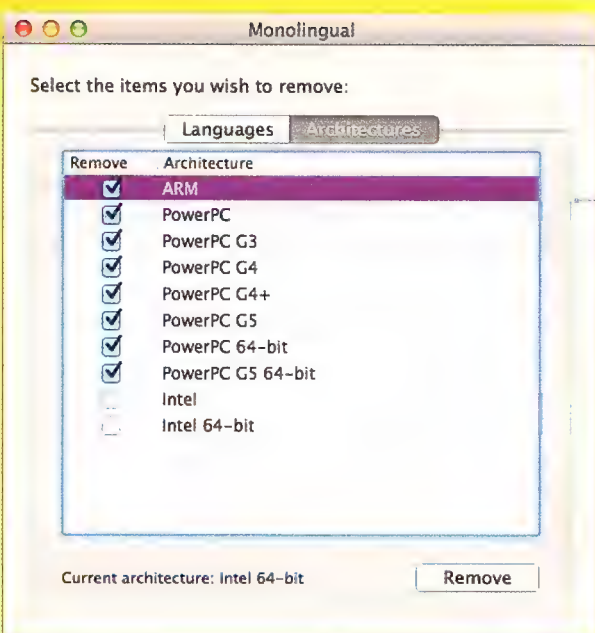
Click on the 'Architectures' tab in Monolingual and select the CPU architectures you're not using. Click 'Remove' and you'll gain gigabytes of space. One word of caution: even if you're on an Intel Mac, if you use any applications that require Rosetta, don't remove the PowerPC architectures or Rosetta will stop working.



Even if iTunes has no problem finding your new iTunes Media folder, it may have trouble with individual files. You'll get an alert like this if that happens.

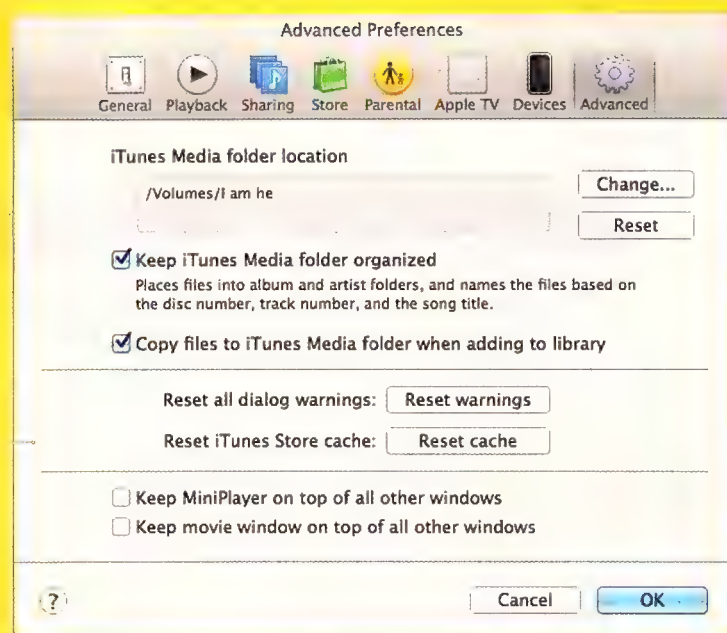
Monolingual can free up huge amounts of storage if your startup disk is getting tight.





Monolingual's other trick is to remove the bits of your applications that aren't needed for your particular computer.

iTunes does much of the work for you if you want to move your media.



- **Move your pictures and tunes.** Last issue we finished by (rather glibly, we admit) telling you to move your iPhoto and iTunes libraries off your startup disk to gain space. This is good advice and we stand by it. Not only is it a way to regain space, but getting these important media libraries away from your startup disk makes them less vulnerable to loss if your startup disk is corrupted and easier to back up using a tool such as SuperDuper or Carbon Copy Cloner. Also, if your house is on fire and you want to grab your photo library (the way you used to pack your photo albums into the Kingswood back in the day), an external hard drive is easier to grab and run with than an iMac.

However, we admit, we probably should have actually told you how to do these things. Moving an iPhoto library is quite straightforward, but an iTunes library less so.

To relocate your iPhoto library, open the 'Pictures' folder inside your user folder and find the package called 'iPhoto Library' (a package is a type of folder that behaves like it's a single file; the iPhoto library is one). Drag the package to wherever you want to put it – on an external hard drive, for example. Next, open iPhoto. Go to the 'File > Switch to Library' and select your iPhoto 'Library' in its new location. Just like that, you're done. Provided all seems hunky dory, you can then delete your old library and enjoy all those gigabytes.

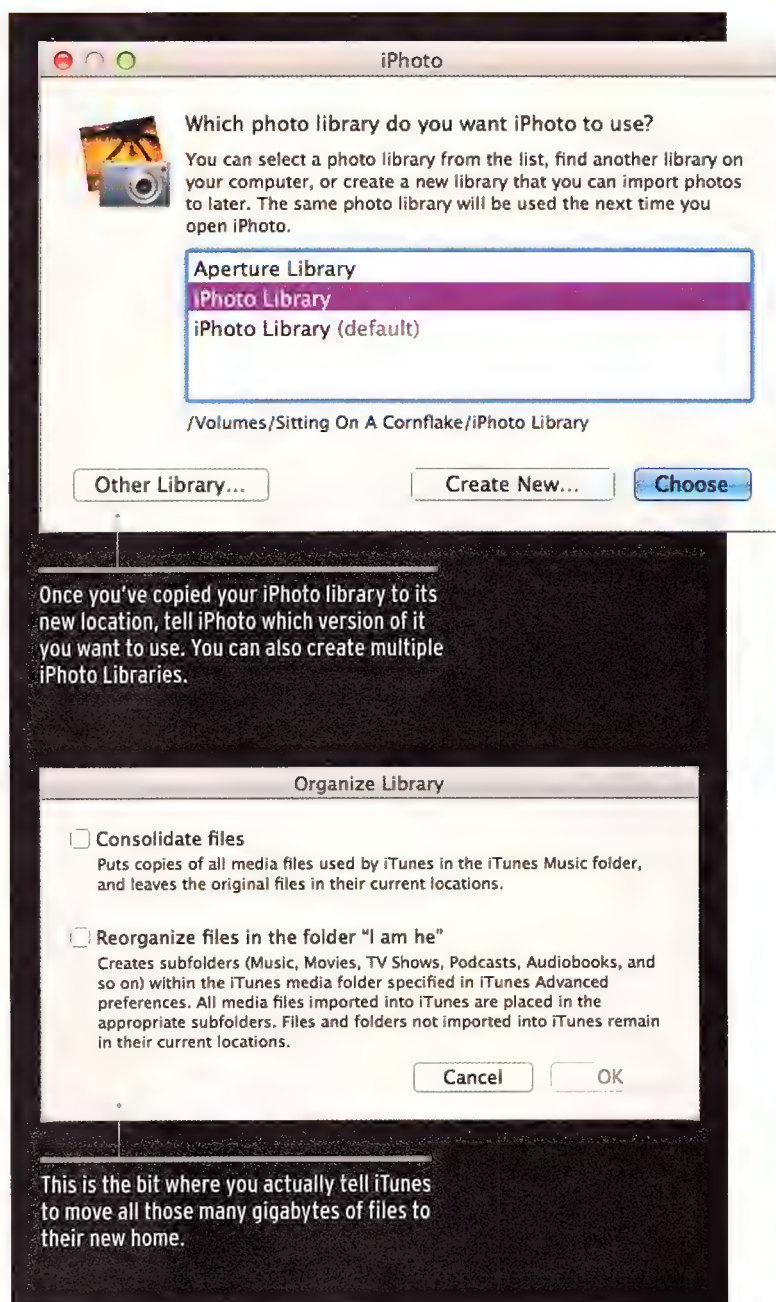
An iTunes library is a little trickier to move, but easier than it used to be. First, open iTunes 'Preferences' and select the 'Advanced' tab. Make sure that both 'Keep iTunes Media folder organized' and 'Copy files to iTunes Media folder when adding to library' are ticked. Then, next to where it says 'iTunes Media folder location', click on the button that reads 'Change'. A dialogue box will open, enabling you to navigate to wherever you want your iTunes media to reside. It doesn't necessarily have to be in a folder called 'iTunes Media', incidentally – ours isn't – but it's a useful convention to follow. If you wish, create a folder on an external drive, name it 'iTunes Media' and click 'OK'.

Then, go to 'File > Library > Organize Library' and in the resultant dialogue box, select 'Consolidate files'. Then go get a cuppa. After some considerable passage of time, depending on how much media you have, your iTunes media will have been copied to the new location and placed in nice little organised folders for music, movies, podcasts and so on.

Now, go back to the 'Music' folder in your user folder and find the folder called 'iTunes'. Inside that there'll be a folder called 'iTunes Media' (or if you've been using iTunes for a long time continually, it might be called 'iTunes Music'). Move that folder *and only that folder* to the 'Trash'. Under no circumstances should you move anything else in your iTunes folder unless you know exactly what you're up to.

Quit iTunes and then open it again. If you don't get a message saying that the 'iTunes Media' folder couldn't be found, try playing some media files. If all goes well and you don't get any 'Cannot be found' messages, feel free to empty the 'Trash'.

So now you've freed up quite a lot of space on your startup drive, which is great. Use it well and don't forget to back up the drive(s) containing your iTunes and iPhoto libraries. **ETIC**



Sexify your home screen

Simon Chester explains how to take advantage of Android's customisability by creating a unique home screen.

YOU'LL NEED THIS

A WALLPAPER APP OR SITE

We like the sites interfacelift.com and wallbase.cc.

UCCW

Get the Ultimate Custom Clock Widget from tinyurl.com/kl3j3eg. It's free.

CUSTOM FONTS

www.fontsquirrel.com has a selection of fonts you can download and copy to your device.

Android is always touted as being customisable, but even with all the ROMs, launchers, replacement system apps and lock screens, nowhere is more noticeable, striking or potentially unique than your home screen. With a few select apps, you can turn your stock Android handset into something truly unique. Best of all, no root is required (see images **A B C D**).

The easiest thing to customise is your wallpaper. These have to be at least the same resolution as your device's screen and double the width if you want it to scroll when you move between home screens. For our HTC One, we need a 1,080 x 1,920 image for a static wallpaper, or a 2,160 x 1,920 image for a scrolling one. There are wallpaper apps out there or you can browse sites like interfacelift.com, wallbase.cc, 2048px.com or www.vladstudio.com. Then just download, crop and copy them to your phone (to save wires, we have a wallpaper folder in our Dropbox account, automatically synced via Dropsync).

To really change the look and feel of your home screen, you'll need widgets. While there are countless readymade widgets out there – providing you with calendar, battery, clock, date, toggles and other information – the best on the Play Store, UCCW (once known as Ultimate Custom Clock Widget) allows users to create their own.

However, despite its supreme customisability, perhaps the best thing about UCCW is that you don't have to create the

widgets yourself – there are many user-generated widgets available on the Play Store (search for UCCW skin) and online at mycolorscreen.com (a place to show off and distribute customised home screens).

If you want an easier setup, Beautiful Widgets, Agenda Widget Plus, Switch Pro and many others offer attractive, customisable widgets that require less fiddling.

Love fiddling and the most extreme customisation possible? UCCW provides you with a blank canvas upon which you can create any number of shapes, values (like unread counts or Tasker variables), text or touchable hotspots. Below, you can follow along with us to create a very basic widget in UCCW.

Many people use replacement Launchers (the app that's in charge of your home screens), such as Nova or Apex launcher, to hide the dock and notification bar, preferring to replace them with widgets that do the same tasks in a much more attractive manner. These launchers also allow you to change the number of 'spaces' available on, and the margins surrounding, your home screens, giving you near limitless layout options, so we really recommend you switch to one.

The final part in creating attractive, personalised home screens is replacing your app icons. Again, most replacement launchers support this function, either on an app-by-app basis or through special 'icon packs' available on the Play Store. One icon creator app that we quite like is Simple Text, which allows you to create beautiful text-based icons that go well alongside a text-based clock like Minimalistic Text (see image **E**).

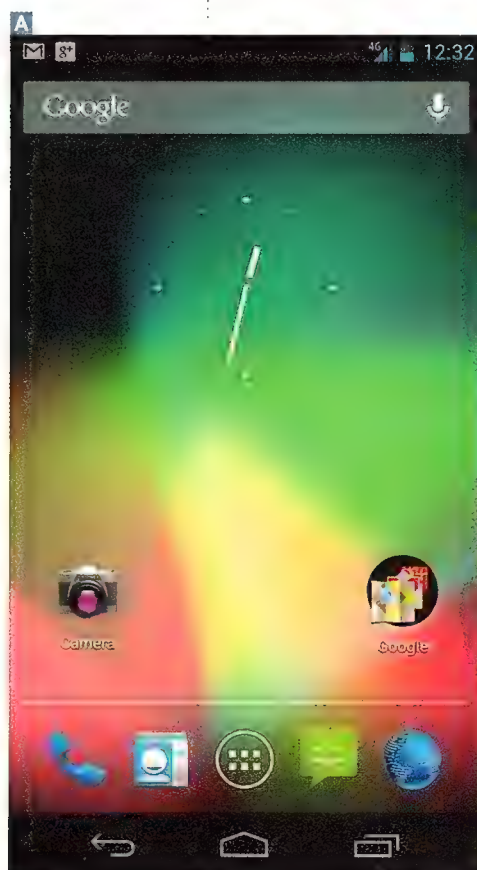
HOW TO CREATE A WIDGET IN UCCW

First things first: it's a good idea to sketch out what you're looking to create. What elements do you want to see: Clock? Weather? Battery? Tasker variable? How do you want them laid out? How will it complement your chosen wallpaper? Once you have a concept sketch or at least a basic idea, you can proceed to lay down the elements in UCCW.

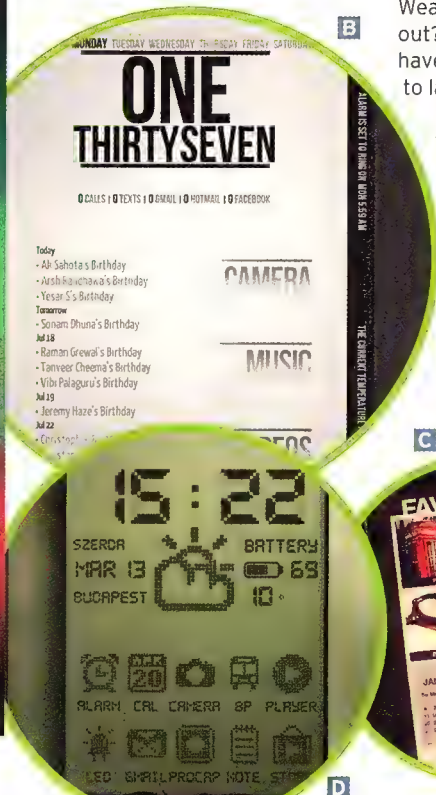
As UCCW widgets support custom fonts, it's a good idea to head over to www.fontsquirrel.com, download some nice fonts and copy them over to your device (in the 'sdcard/fonts' directory). To get started on UCCW, follow these instructions to create a simple clock widget (see image **F**).

You begin by touching and holding the blank area of your home screen where you wish to place the widget, then selecting 'Widgets > UCCW' and the size you're after. We decided to create a 5x1 widget that will stretch the length of our home screen. Possible items to display include call/SMS/email counts, weather icons/text, battery level or if you use Tasker, any of the many variables seen at tinyurl.com/nyvp2jr.

This is a tremendously powerful feature and an example on how to create a WhatsApp unread message count is available at tinyurl.com/jvpfhd8.



The stock Android home screen isn't exactly inspiring.

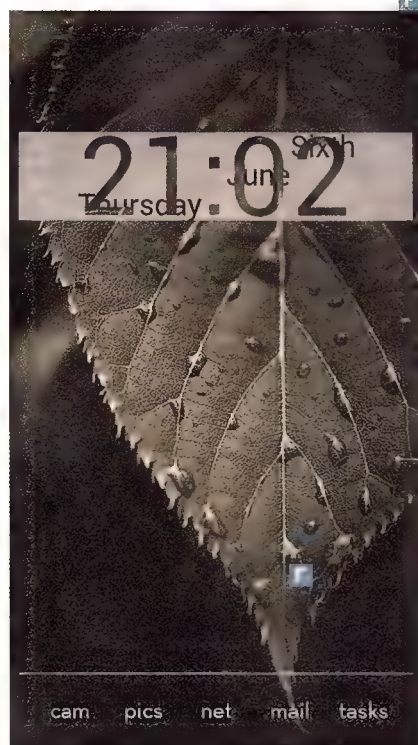
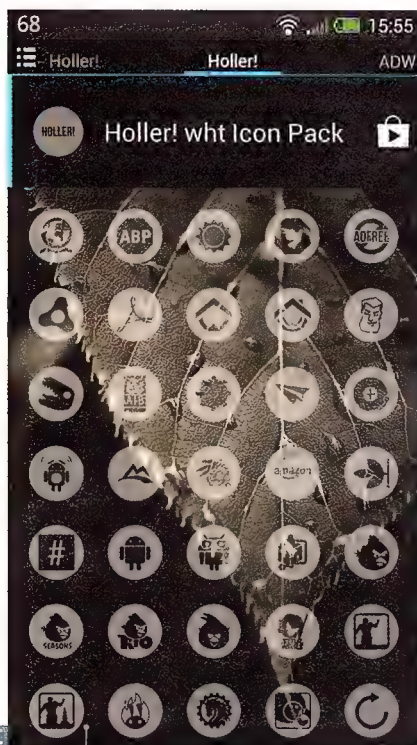


B

C

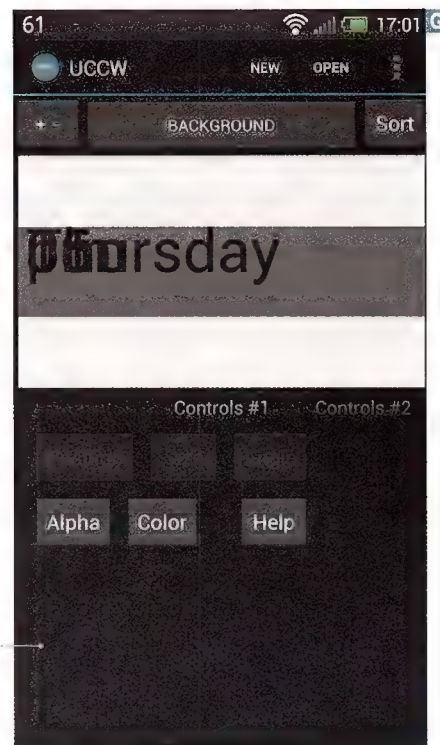


B C D Some examples of unique interfaces you can achieve without rooting your phone.



Here's our
finished widget.

Our widget
looks a little
messy at first.



A pack like this offers a range of icons to choose from.

Once you select the size of your widget, you can either choose a downloaded UCCW widget from the list or in this case, select 'New' from up the top of the screen.

You're now in the widget editing screen, with a plain white widget of your selected size. It's not a... nice day for a... white widget, so hit the 'Color' button and enter `c0c0c0` in the box to turn it grey.

Next, add in some objects. Hit the '+' button and choose the elements you want. Here we'll select 'Time', 'Am/Pm' (if you don't do 24 hour), 'Day of the month', 'Day of the week' and 'Month'. They'll appear

all piled on top of each other, so we have to move them (see image [G](#)).

Select individual elements by pressing the big button up the top (at this point, it should be labelled 'Background'), select 'Time' and then drag it where you want it. You can finetune this position to better align it with the other objects by pressing the 'Position' button.

Let's hit the 'Size' button and change it to '100'. Additionally, you could select a colour (with previously selected colours appearing down the bottom of the colour selector), its transparency ('Alpha') and the angle that the text sits at.

Every element has extra sets of controls that allow you to adjust specific things, accessible by swiping over to the right. Swipe over to 'Controls #2' and choose 'Special Effects > See through effect' to make the text cut out from the background. If you wish, change the clock to 24-hour time by swiping all the way over to 'Controls #5' (see image [H](#)).

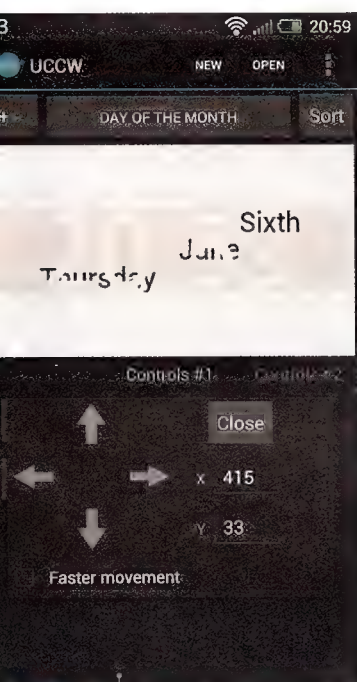
Other things you might want to change include the font ('Controls #4') or the shadow ('Controls #3'). To get an idea of what the different controls do, press the 'Help' button on 'Controls #1'.

Next, we also changed the day of the month to text. Select it from the middle button, navigate to 'Controls #7' and go to 'Format > Custom Text'. We made all the date elements size 40, centred them and placed them so that the day of the week lay underneath the hours, the month underneath the 10 minutes and the day of the month underneath the single minutes.

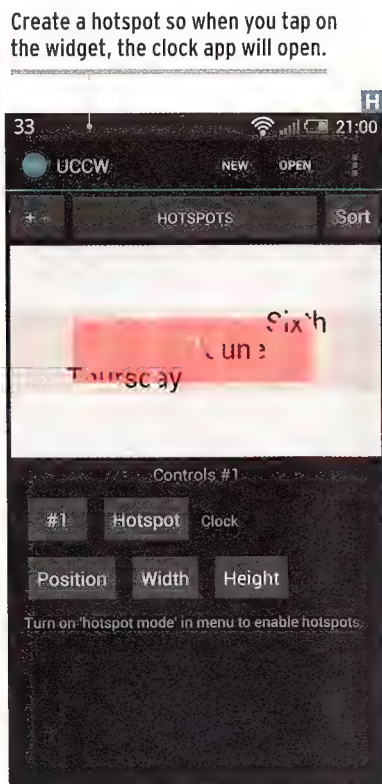
Happy with your layout? Next up is hotspot creation, so that when you click on the widget, it will open the clock app. Simply click on the big button up the top again and select 'Hotspots'. You only need the one, so ignore the hotspot selector button ('#1'), click on the area that you want it to appear (or manually type in its coordinates using the 'Position' button) and make it an appropriate size using the 'Width' and 'Height' buttons. When you're finished, turn off hotspot mode so that the widget works as expected – until you do this, touching the widget will open the UCCW editor (see image 1).

To finish up, hit 'Sort' and move 'Time' down the bottom, so that it cuts out the words sitting behind it. Press the big middle button, select 'Background' and change the 'Alpha' to '180'.

This will give you a simple, if basic, rectangle clock for use on your home screen. However, it's really only the very beginning of what you can achieve with your Android phone. We highly recommend you visit the (epic) XDA thread at tinyurl.com/nynekgv for tips on how to get the most from UCCW. [AUC](#)



You can move the elements of the widget wherever you want.



All your news in one place

Alex Cox explains why you don't need to trawl the web for news — RSS does it all for you.

YOU'LL NEED THIS

THE OLD READER

There are a whole host of RSS readers out there, but we love The Old Reader, available from www.theoldreader.com.

Once upon a time, we had a daily routine. We'd open up our web browsers in the morning, launch lots of tabs and laboriously hop through our essential sources of news and fun. Not only was this slow, but we were bombarded with ads and unwanted stuff. Sometimes, the site we were looking for wasn't even updated. Save yourself the disappointment of no new content — and the time-wasting of having to visit each site manually — by using RSS feeds. This stands for 'really simple syndication' and it's akin to following someone on Twitter or being his or her friend on Facebook. The content from your favourite sites will be automatically sent to a reader app, which will list any new posts and updates, let you categorise them, mark them for later reading and much more.

It's easy and free, and you'll love subscribing to new sites. Here, we'll show you a few great ways to make the world of RSS work for you.

FIND THAT POST

There's an integrated search facility — this means that even if you can only remember a fragment of a post's contents, you should still be able to bring it up.

FOLLOW EVERYTHING

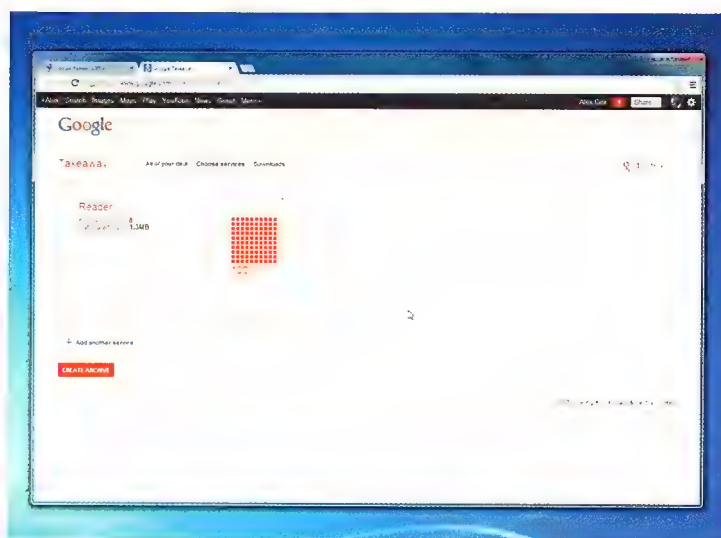
Fill your feeds list with as many sites as you like — the vast majority of blogs, news sources and more support it.

CLEAR THE DECKS

The button 'Mark all as read' is your friend. It will return your feed list to zero, so you'll know what's new. However, you'll still be able to look through old posts — nothing is deleted.

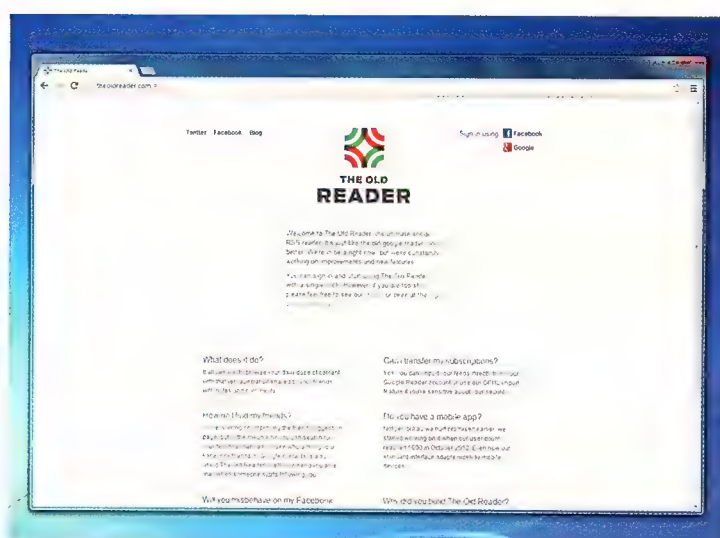
KEEP UP TO DATE WITH RSS

Never miss a story or headline with our guide to using The Old Reader.



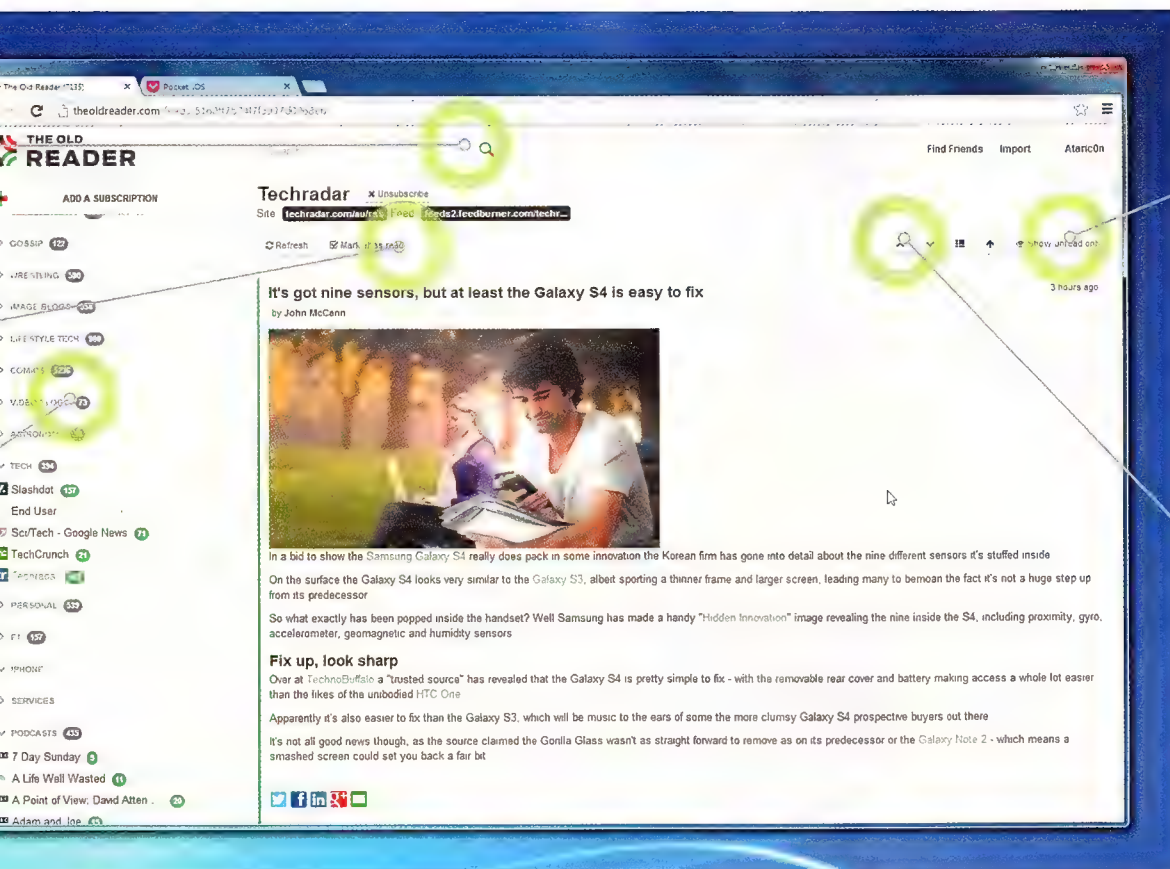
01 NOT NEW TO THIS?

You may already have been subscribing to RSS feeds through the Google Reader service, which will have closed by the time you read this. If that's the case, you can export your current subscriptions to import them into one of the other services we're going to cover. Just open Reader, click the cog symbol, go to 'Reader Settings > Import/Export' and follow the 'Google Takeout' directions.



02 CHECK OUT THE SITE

The first thing you'll need is a good reading app. You can do this offline, but it's more convenient to sign up with an online service. We'll go with The Old Reader, which is a clean, easy-to-use RSS reader. Visit www.theoldreader.com to get a quick overview and then click one of the buttons on the top-right to sign in with your Facebook or Google login details and get things rolling.



UNREAD OR READ?

Sometimes when flicking through a feed it can pay to have access to items you've already skimmed, particularly if you're looking for something a little more specific.

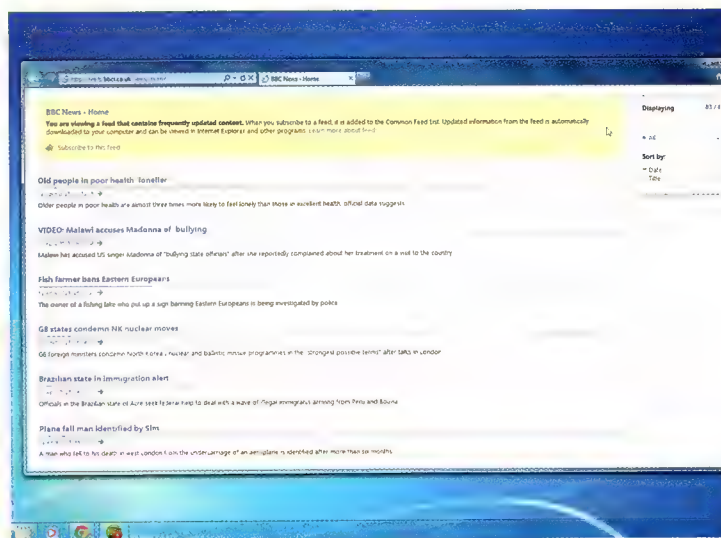
QUICK CONTROLS

You can skip to the next or previous post, switch between list and full views, and even reverse the order of posts with this selection of handy buttons.



03 FIND A SITE

Open a new tab and visit a site you'd like to subscribe to. We've chosen www.news.com.au/breaking-news just as an example, because having the latest headlines at hand is always useful. The next bit is a little tricky because it differs for every site. You'll need to find a link to the site's individual RSS feed. This is a small file that sends information on the latest site updates to your reader.



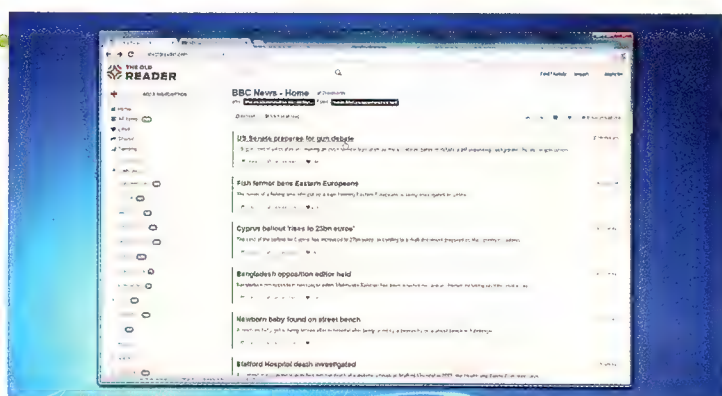
04 FIND A FEED

In the case of the news.com.au site, you'll find the RSS feed at the bottom of the page. The logo is a pretty universal identifier across the web, so keep an eye out for something similar in the sites you're interested in subscribing to. Click on the link and you'll see a page containing links to the news categories you can subscribe to with your RSS feed.



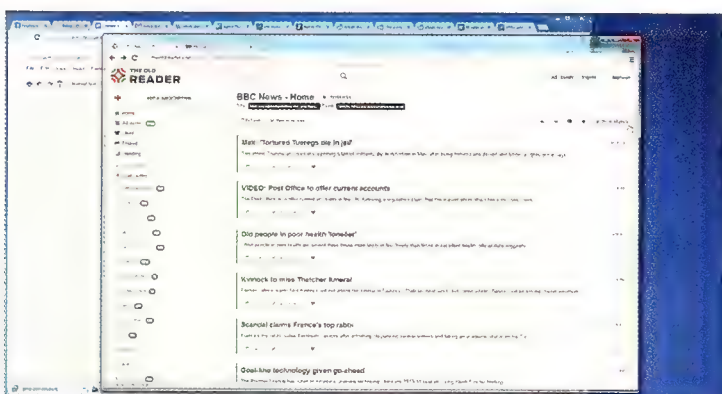
05 CHECK OUT THE CONTENTS

Right-click the RSS link and copy its location. The location of the file is the info you'll need to give to your reader app to start your subscription – once it's done, your reader will automatically grab the latest updates. You need the link, rather than the file, because your reader will always look for the very latest version.



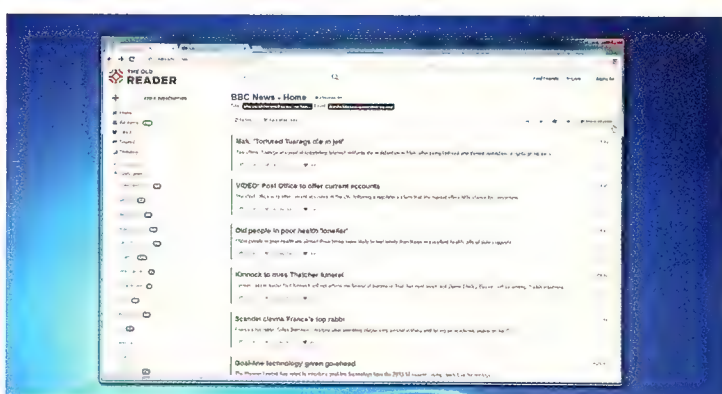
06 ADD THE FEED

Go back to The Old Reader. At the top-left, you'll see 'Add a subscription'. Click it, paste the link you just copied in the box that appears and click the plus (+) button to add a subscription to your list. To test it, just click on the feed name in the list on the left-hand side – you should see the contents of the feed on the right.



07 READ & UNREAD

Scroll through the feed to see what's happened recently. Shortened feeds give you a brief snippet, but if you want to read a story further, you can jump straight to the full article by clicking the headline. Note the 'Mark as unread' button below each item – if you don't have time to read the full thing, use this to save it.



08 HIDE OLD POSTS

By default, The Old Reader is set to display all posts, even those you've already read. Those that you haven't yet read are highlighted with a border. If you return to a feed to find its latest updates, you might have to scroll through a bunch of posts you've already read. Use the 'Show unread only' button to limit it to new posts only.



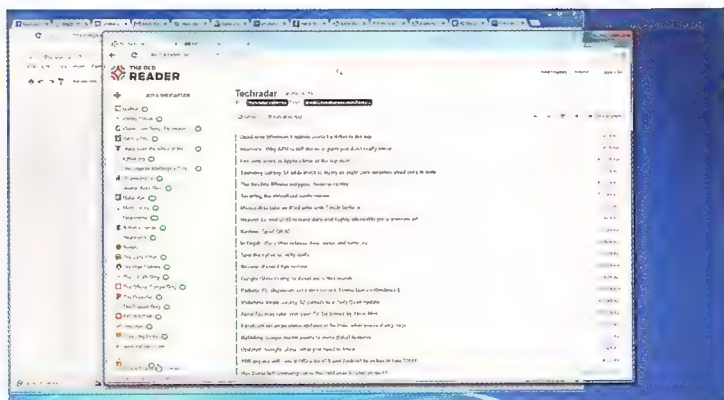
09 'LIKE' TO SAVE

The 'like' button is very powerful – if you've used Google Reader, it's the equivalent of the 'star' function. When you 'like' a post, it gets added to your 'liked' list in the column on the left. This is a way of cataloguing posts for later reading. We'd recommend unliking posts once read, otherwise the 'liked' list will start to get a little crowded with content you've already been through.



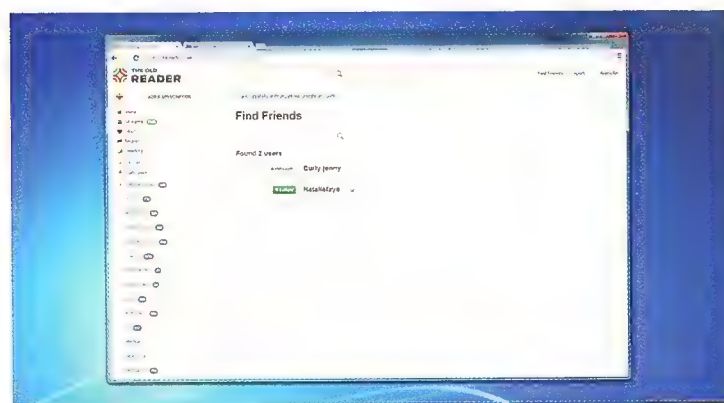
10 SLIM IT DOWN

Once you've collected together a few feeds, you can view the content of each one by clicking its link on the left; you can also select all of your subscriptions by clicking 'All items' at the top of the list. When you're looking at a feed, there's an icon on the top-right that lets you choose between a list view of just its headlines or a full view containing the text of the post in a line.



11 MOVE IT AROUND

Ordering your feeds into a list is easy. Just click and hold the left mouse button, then drag your chosen feed, releasing the button to drop it in place. Using folders bundles feeds into one easy-to-read stream. Drag an item right to the bottom of the list and you'll see an option to create a new folder.



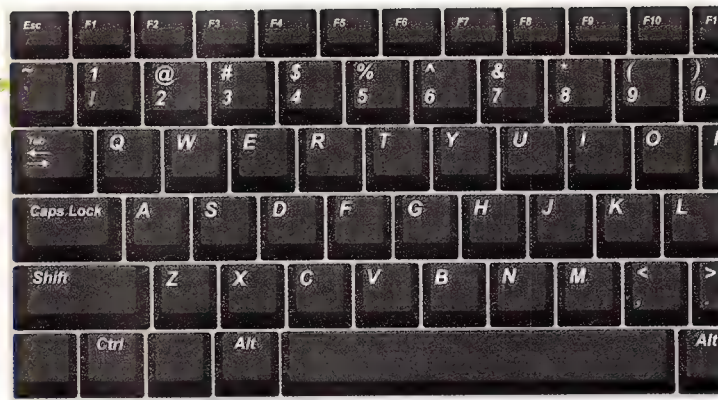
13 FIND FRIENDS

The Old Reader isn't just a one-person affair. If your friends are using it, you can follow them and enjoy any posts they share. Finding other The Old Reader users is easy, since it can link to your Google or Facebook account. Just go to 'Find Friends' at the top of the interface, click 'Follow' next to the person you wish to follow and then view their shares under 'Following' on the left-hand side.



15 FIND MORE SOURCES

The import process isn't instant, particularly as The Old Reader has seen a massive uptake in use since Google Reader announced its closure. You'll have to wait a little while for your old feeds to make their way into your new list. While you're waiting, why not keep an eye out for Atom feeds? They're essentially the same as RSS and they'll work perfectly with The Old Reader.



12 USE THE KEYBOARD

Save your scrolling finger some effort. The best way to flick through feeds is to use the keyboard, as it allows you to jump directly to the next item. Just press J or N to jump to the next post, or K/P to jump back to the previous one. Pressing L marks a post as 'liked' and S shares the post, which we'll come to later.



14 IMPORT FEEDS

If you've previously used Google Reader, you'll have exported your feeds earlier on. To use these with your new reader, just open the ZIP file you downloaded and pull out the file named 'subscriptions.xml'. Go to the 'Import' screen within The Old Reader (the link is at the top of the interface), click 'Choose file', select the XML file and then click 'Import' to send it to The Old Reader's servers.



16 ENJOY THE WEB!

You've done it – the web and its many stories are now at your fingertips. We're completely sold on the idea of RSS feeds and we're not sure exactly why Google decided to close its own service. Using The Old Reader, or similar services like www.feedly.com, you can stay on top of the news on your favourite corners of the web, and you can do it all for free. **END**



Free video editing with Blender

Blender had video skills from an early age, so let's reclaim that role with **Neil Mohr**.

YOU'LL NEED THIS

BLENDER

Head to www.blender.org and grab the latest release of Blender. It's free and less than 50MB.

STORAGE, VIDEO & LOTS OF PATIENCE

To try Blender you'll need a bit of patience to learn its confusing interface alongside any old video footage. For a real video project, a good few gigabytes of spare drive space would be recommended.

Blender, from the usefully named www.blender.org, is best known for being the smarts behind an entire industry of 3D rendering. The odd thing about it is that despite its most famous use as a free high-end rendering package, it's actually had non-linear video editing capabilities built in for most of its open-source life.

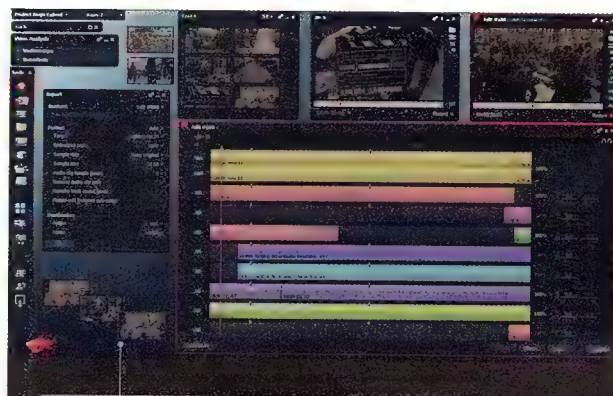
The plus points are that Blender is free and as a non-linear video editor, it offers basic editing features, it can juggle hours' worth of video, has real-time rendering and multiple video and audio track support. The bad side to Blender is that it's easier to learn some second-order differential equations on a packed commuter train than learn the Blender interface. We're going to help cut through the complexities, but the steep learning curve means that for some, sticking with Windows Movie Maker is the truly smart thing to do.

If you're willing to stumble around a complex interface, the flexibility of Blender's editing capabilities is its clear advantage over Windows Movie Maker. We're going to admit that if you want to create any sort of semi-professional production, you're ultimately going to be best off investing in a commercial product. Not because Blender is a bad non-linear editor, but because of the extra dedicated video features and templates pro-level packages bring to the party.

BLENDING FINGERS

The biggest stumbling block for general Blender use is getting to grips with its crazy, bespoke interface. It's set up for super-slick 3D manipulation using a mouse, rather than any standard Windows interface you're used to. This is partly down to the developer coming out of Amiga development, where it was common to use your own interface style.

The key thing to get your head around is that tracks are selected with the right mouse button. While you'll have had a lifetime of left-clicking, forget that, Blender is all about the right button. Doubly odd is that if you're moving tracks to then drop them, you use the left mouse button, not the



Used by the big studios, but probably not for \$60.

FREE OPTIONS

In a world usually well-supplied with free open-source options, video editing is the one area where the choice is severely limited. Windows Movie Maker is the prime choice and it's good enough for throwing a few clips together with transitions and titles. It'll even shove the end result to DVD or YouTube.

A number of poor choices exist such as Avidemux, MPEG Streamclip, VirtualDub and Free Video Dub, but none of these offer any polish, ease of use or the level of editing features you'd want. If you're after something to trim and combine clips, opt for Freemake Video Converter (www.freemake.com). The obfuscation-free named Free Video Editor Software (www.videosoftdev.com) is comprehensive, but is something of a pain to learn to use. Pinnacle used to offer the rather spiffy VideoSpin, but has removed it from official distribution.

right. It's possible to zoom in and out of most panels using the mouse wheel and scroll using the super-slim scroll bars at the edges of certain panels.

Outside of the interface, it also turns out to be important that you set the base 'Properties' to the correct frame rate to match your video. If you don't do this, the audio and video won't sync correctly.

PRODUCTION POINT

The smart thing about Blender is that it supports the audio, video and image formats you need it to. Primarily for video that's AVI, MP4 and MOV, and with images it's JPEG, PNG and GIF. Audio as part of videos can be a wide range of standard formats such as MP3, AAC or FLAC – for audio-only files, Blender strangely only supports 16-bit WAV. Other than for audio-only files, getting standard video into Blender is just a simple drag and drop away. It's also an instant process with little to no lag, so there's no waiting around for previews.

Using the master timeline at the very

bottom, you're able to play and pause the footage. The scratchpad here makes it easy to jump to or run through a small section of footage. The basic tools for moving clips around, trimming and cutting footage are easy enough, too. Again, this all works instantly, so for basic editing it's not a bad package and handles masses of video well.

The key limitations become apparent as there are no real templates, presets or pre-created transitions or titles. It offers a powerful cross-fade system with full alpha support – so you can layer plenty of clips, each with their own levels of transparency and fade between them – but for more complex wipes you're on your own.

We'll show you how you can use the built-in keyframe system to create a basic title animation; moving text from an off-screen position to onscreen over a set period. A small tweak to this could create scrolling credits and you're able to add opacity changes, too.

All of this is enough to bang together a solid bit of video footage with some impressive

output quality. It's a better introduction to pro-level editors than using Windows Media Player, thanks to its full timeline system, but if you crave more professional features, consider a full-price option.

FAST DRIVES

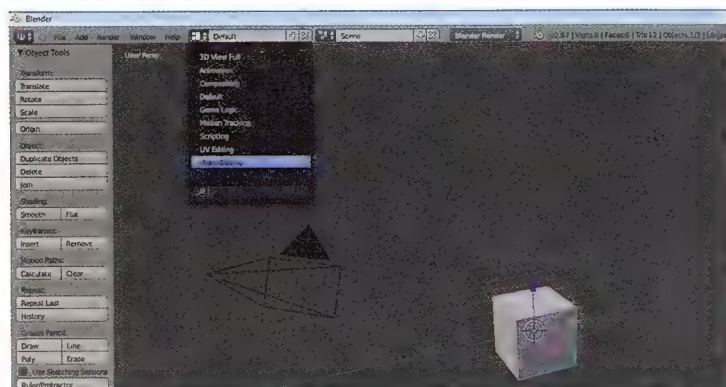
Video editing benefits greatly from high-speed drive access. Ideally, have a dedicated separate drive to work from, or have a large enough SSD (if you happen to have the cash).

MUSIC MATTERS

If your clip seems flat and lifeless, try adding a bit of background music – but not too loud – to give it a lift. It needs to fit the mood, so funny, sombre, dramatic or suspenseful.

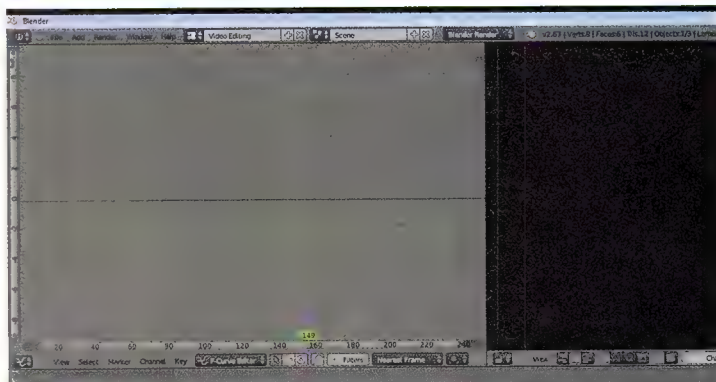
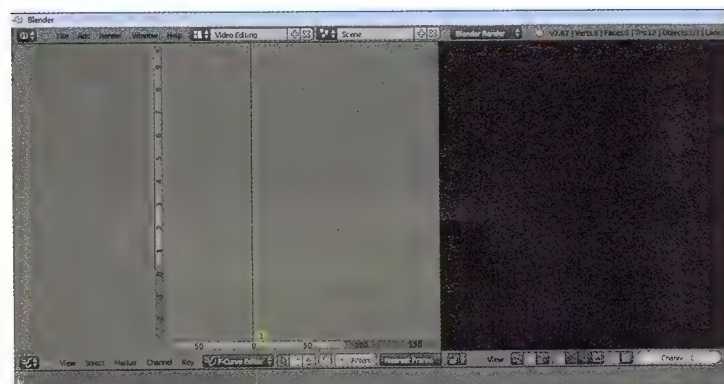
BLENDING YOUR MIND

It's time to get your head around that interface.



01 SHORTCUT TO EDITING

Fire up Blender and behold the magnificence held within its grotesque and twisted interface. By luck, Blender has a predefined video editing mode. To engage this locate the upper-most menu bar. It starts with an 'i' icon and then menus 'File', 'Add', 'Render', 'Windows' and 'Help'. After 'Help' is another little icon that stores the interface presets. Click this and select 'Video Editing'.



02 KNOW YOUR BLENDER

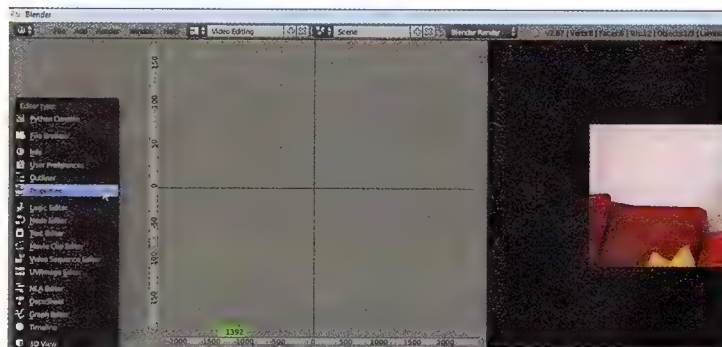
Going clockwise from the top-left is the 'Graph Editor', which we'll use for audio fades. Next is the main 'Video Sequence Editor' and below is the strip timeline where the various audio and videos segments are shown. At the bottom is the master timeline. Note that Blender places each panel's menu at the bottom, so you can maximise/minimise any by pressing Shift+spacebar.

03 STRANGE DAYS

You can scroll the menu strips with the middle mouse button if they're too long. As you add video clips, these are selected with the right mouse button, using Shift and then right-clicking to multi-select them. The scale-like strips running along panels double as scroll bars – you can enlarge these vertically by dragging the tiny dot at the end of the bars.

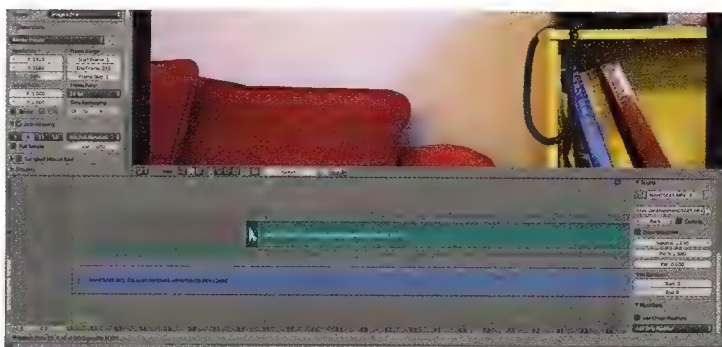
EDITING VIDEO IN BLENDER

It's time to blend some video together.



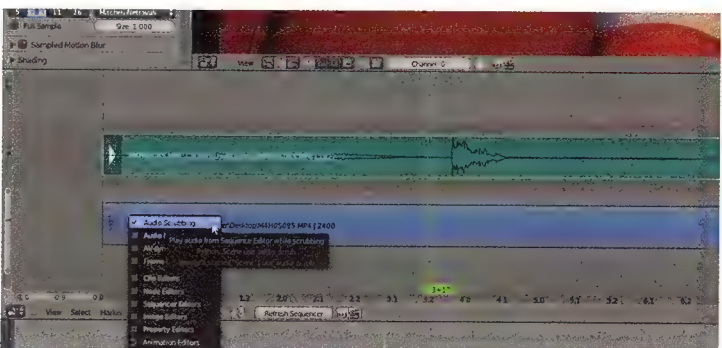
01 ADJUST & IMPORT

Before importing video, set Blender to the correct resolution and frame rate, otherwise it'll drop frames from your imported clips. Click the bottom-left icon of the unused 'Graph Editor' and select 'Properties'. Under 'Dimensions', ensure 'Frame Rate' matches your video (probably 29.97fps) and check the 'Resolution' – this will likely be either 1,280 x 720 or 1,920 x 1,080. Then drag it onto the timeline.



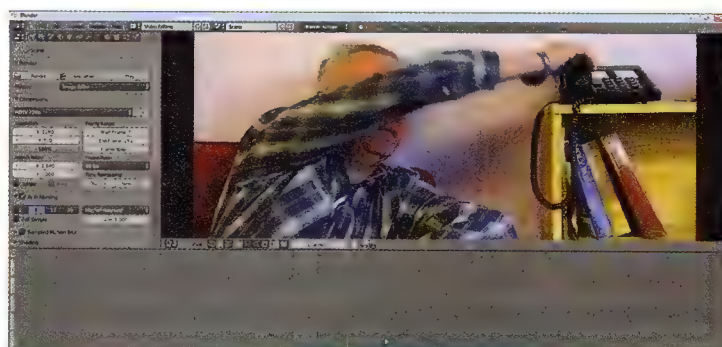
03 BASIC EDITING

Open the 'Add' menu at the base of the main timeline. You can easily delete strips by pressing Delete. Each strip has a start and end handle and you can clip the strip by grabbing and dragging these. You can also duplicate strips with Shift+D. Press B to enable a drag-and-drop multi-select box. To split video, press K – this uses the clip system. Press Shift+K to hard split the clip.



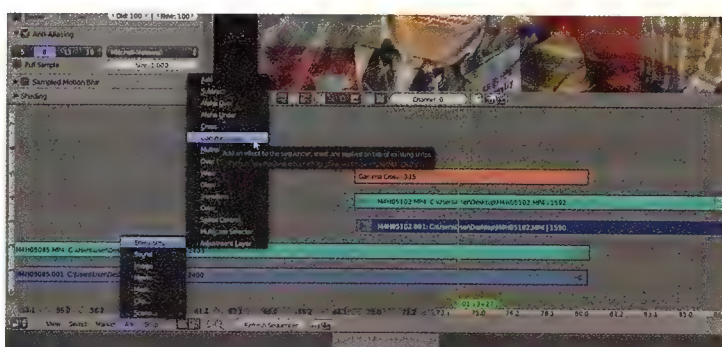
05 TWEAKING SOUND

Default scrubbing ignores audio – you can turn this on using the master timeline. Do this by selecting 'Playback > Audio Scrubbing', so audio is also previewed. Select an audio strip, press N to open the 'Properties', scroll down to find 'Sound' and tick 'Draw Waveform' to add a waveform to the timeline.



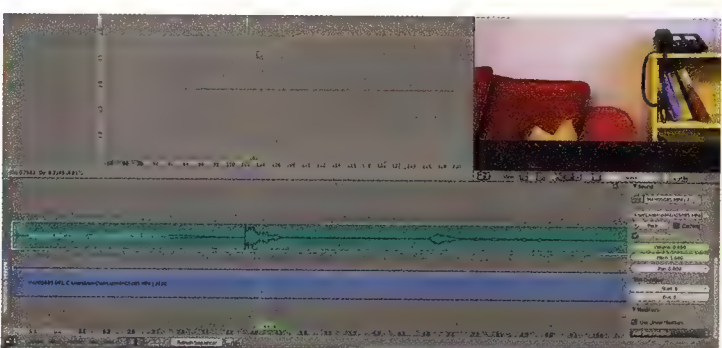
02 GET COMFY

At the very bottom, open the 'Sync Mode' and choose 'AV-sync'. Play the video with the controls to the left. Left-click and drag the master timeline (scratchpad) at the bottom to scan your video. The green strips are audio, blue are video and yellow are effects. Hover the mouse over the left edge of the video preview panel and you can drag and resize it. Use the mouse wheel to enlarge the preview.



04 ADDING TRANSITIONS

To add a second overlapping bit of footage, you'll need to press Shift and right-click the first and then second video strip, select the timeline and click 'Add > Effect > Gamma Cross'. This will add a basic fade transition between the two clips. Press N to see the 'Properties'. Fading the wrong way around? Select the effect strip, open the timeline 'Strip' menu and select 'Swap inputs'.

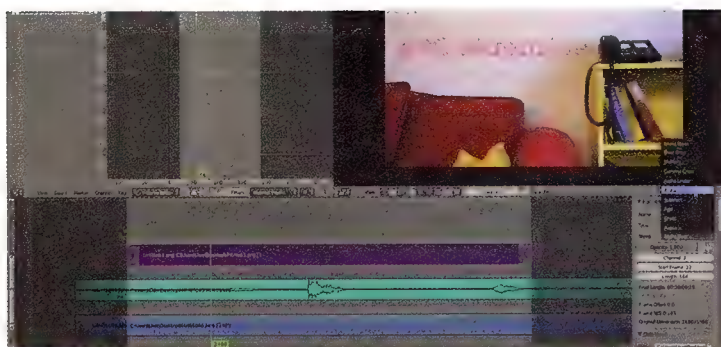


06 FADING AUDIO

Audio fades are generated via the keyframe system. Select the audio strip required and cue up the start point, set the volume level via the 'Properties' and with 'Volume' selected, press I. Now cue up the end point for the fade and follow the same process. Markers for the start and end will appear in the master timeline and the 'Graph Editor'.

TITLES & EXPORTS

Simple titles and outputting a final video.



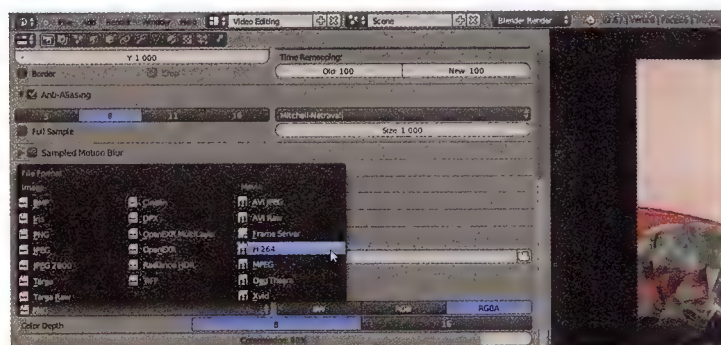
01 YOUR TITLE

Titling in Blender has to be done via your own created images. In GIMP or Photoshop, create a correctly sized image with a transparent background. Drop this into Blender, press N to view the 'Properties' and select 'Blend > Alpha Over' to create the transparency. Further down the 'Properties', adjust 'Multiply' for a see-through effect – you can adjust the colour and intensity, too.



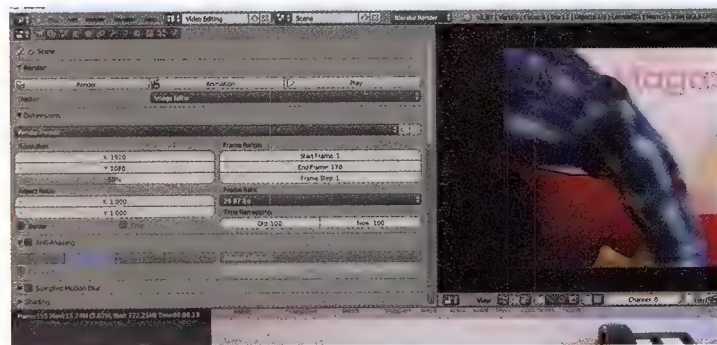
02 TITLE ANIMATION

Using the keyframe system, create a scroll effect for the title. Select the image strip and move to the start. Locate and select 'Image Offset' in the image 'Properties'. Left-click on 'Y', drag right to move it offscreen and then press I to create the keyframe. Drag the scratchpad towards the end of the image strip, move the logo down and press I to scroll the text down on screen.



03 SET THE OUTPUT

Change the top-left 'Graph Editor' section back to 'Properties' by selecting its icon in the bottom-left of the panel. Scroll down to 'Output', change 'PNG' to a suitable video format (ideally, H.264), select 'RGB' output, set the format to 'H.264' and for the audio to be 'MP3'. You'll find that Blender isn't the fastest rendering option around. Even a short clip is going to take a while to complete.



04 ACTION!

Under 'Output' at the top container is the output file directory folder, so point this to your preferred location. Before you render, scroll to the top and ensure 'End Frame' is set to the correct end frame of the video. Then drag the scratchpad to the last frame and this figure will be displayed at the bottom next to the video controls. Finally, click 'Animation' to render your video sequence.

GOING BEYOND BLENDER

As we've seen, despite Blender's solid video editing capabilities, its bare minimum features leave you with a lot of legwork to do when it comes to adding even basic effects such as transitions or vaguely more complex stuff like titles.

None of this should really be much of a surprise, as all we're doing is effectively introducing non-linear video editing with the only viable free option on the market, which is an open-source 3D raytracing package.

This should highlight the benefits of investing in a full-priced video editing package. We say invest, but even the excellent Pinnacle Studio starts at the bargain price of \$60, with the Ultimate package

costing \$130. Similarly, Sony Movie Studio Platinum retails for \$120. But beyond an editing-optimised interface with all that multifaceted video format support, these packages bring a lot more dedicated features to the video editing party.

Take Pinnacle Studio. One of its modules can create algorithmic music in a wide variety of themes and moods – just specify the length and it'll be automatically generated. Resize the scene and the music track is regenerated for a perfect fit. More obviously it comes with pre-designed titles, transitions and animated special effects, all ready for you to drag and drop your



Sony Movie Studio is lauded for its HD speed.

video onto. There's even chroma-keying, which enables green – or any colour – screen effects you like. That's besides any asset management, font collections, presets and who knows what else is bundled in the box. **apc**



Master the desktop

Henry Winchester shows you how to improve your Windows experience with Preme.

YOU'LL NEED THIS

PREME

It works best on Windows 7. It will run on XP, Vista and 8, but it may be limited. Download it from www.premeforwindows.com.

Windows can be a chaotic place at times. You'll often find yourself with numerous programs running and no idea which one you should be concentrating on. Windows 7's Aero Snap made it a lot easier to organise your desktop neatly, but it's still all too easy to end up with a confusing mess.

Preme is a small but mighty program that aims to fix this little problem. It incorporates some key features found in

Windows 8 – such as hoverable hotspots that let you quickly switch between programs – and introduces lots of little tweaks that make all the windows on your desktop easier to sort, order and manage. Among these are alterations to the minimise and maximise buttons in the top-right of every window, and some really nifty additions to your mouse's scroll wheel function. So, without further ado, it's time to take back your messy desktop!

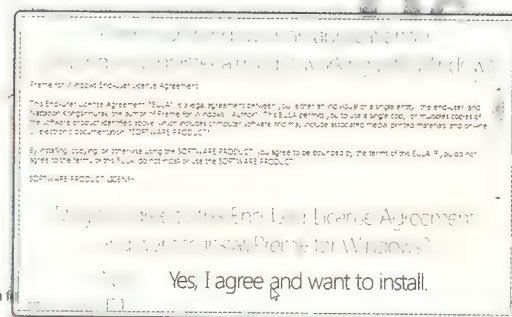
TAKE CONTROL OF YOUR DESKTOP

Make some much needed tweaks to your desktop with the potential power of Preme.



01 PREME TIME

Start by installing Preme from the official site, so point your browser at www.premeforwindows.com. To begin, click the big 'Download' link at the bottom of the page. When prompted, choose 'Save' rather than 'Run' and Preme will be downloaded. Next, double-click on the file to install it. Windows 8 may issue a Smartscreen warning – click 'More info' then 'Run anyway' if it does.



02 ELEVATED PRIVILEGES

Preme will now ask you to install it with or without 'Elevated Privileges' – these give it more control over Windows and provide you with some additional features. We'd recommend installing it with the privileges, but if you'd rather not, you can still follow most of the stages of this tutorial without them. Click 'Help me choose' to find out more about each option.

SIDINGS

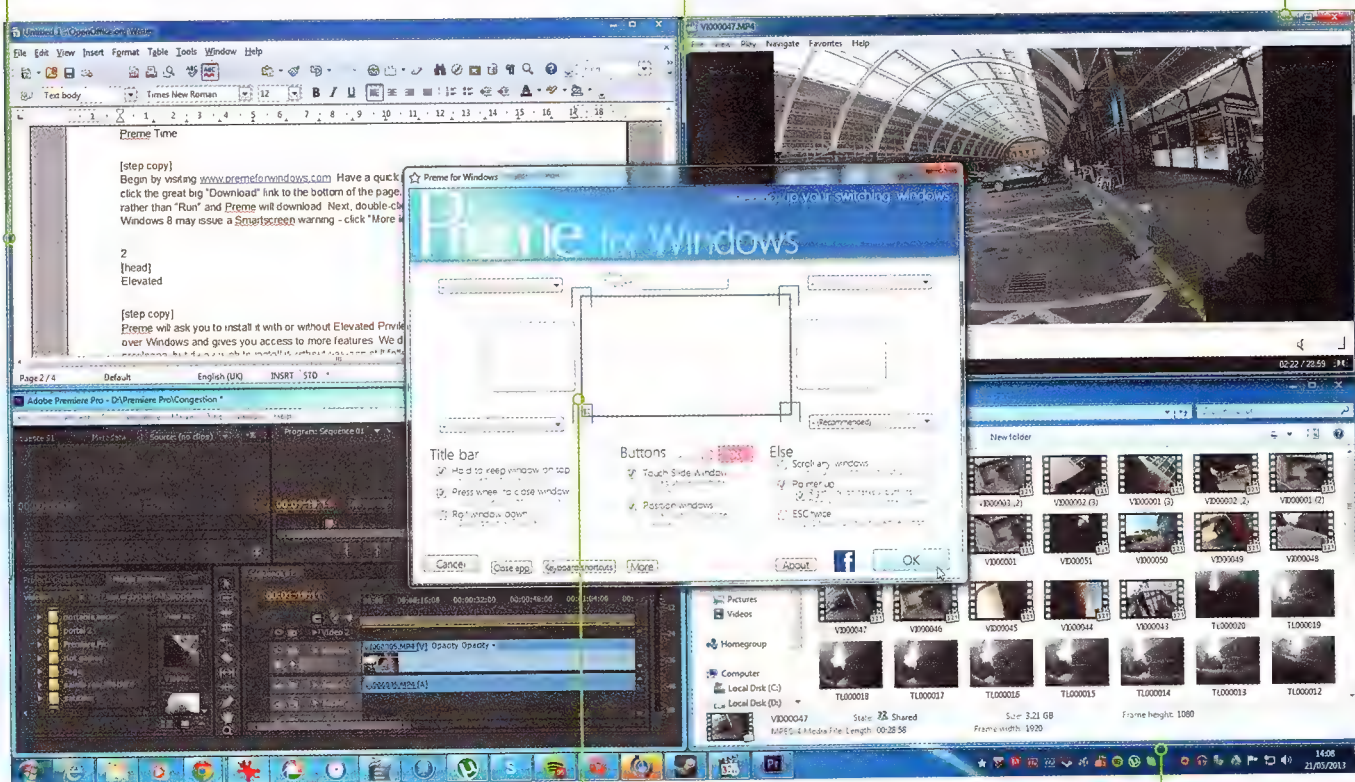
Clicking and dragging the minimise button swipes open windows to the left or right, and they'll pop back up whenever you hover here.

ARRANGEMENT

Preme lets you arrange your windows neatly by clicking and dragging the maximise button towards any corner or side.

BUTTONS

Preme adds lots of functionality to your minimise and maximise buttons. You can also scroll up or down on the title bar to maximise or minimise.

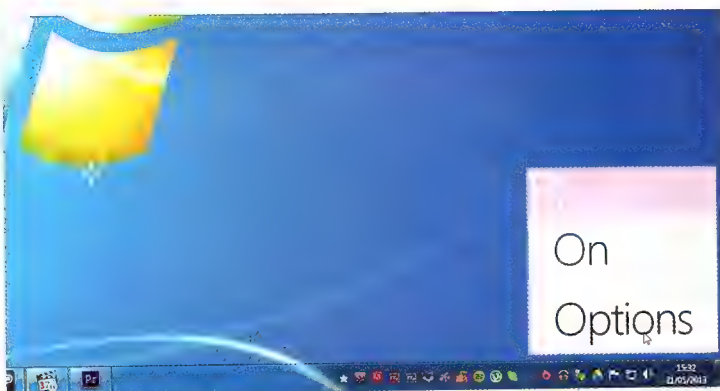


CONTROL

This is where you'll find all of Preme's options. Just about everything can be turned on or off from here, or tweaked to your liking.

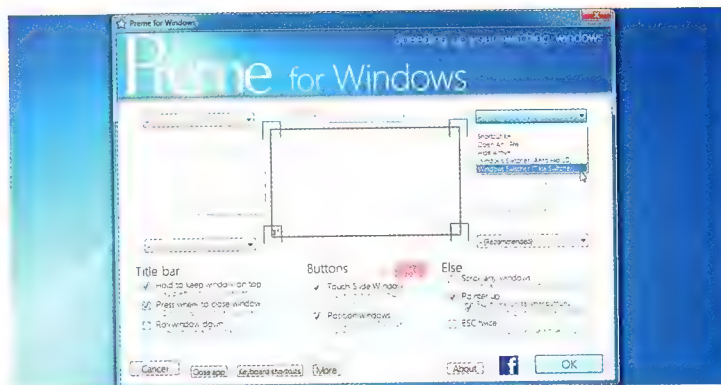
TASKBAR

Preme enables you to scroll your mouse wheel anywhere on the Taskbar to adjust the volume of your speakers. You can also set it to quickly close windows.



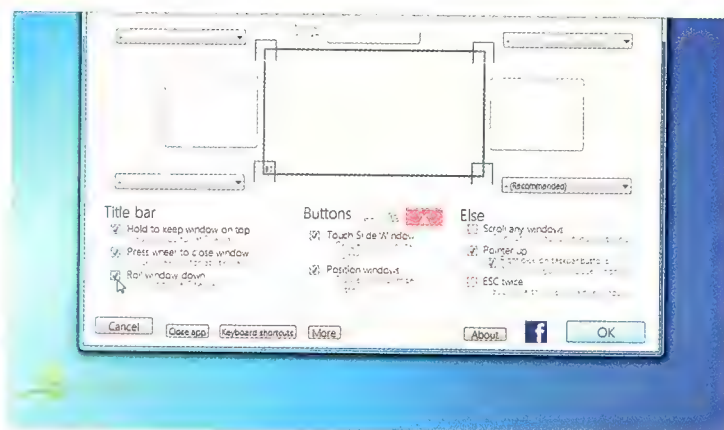
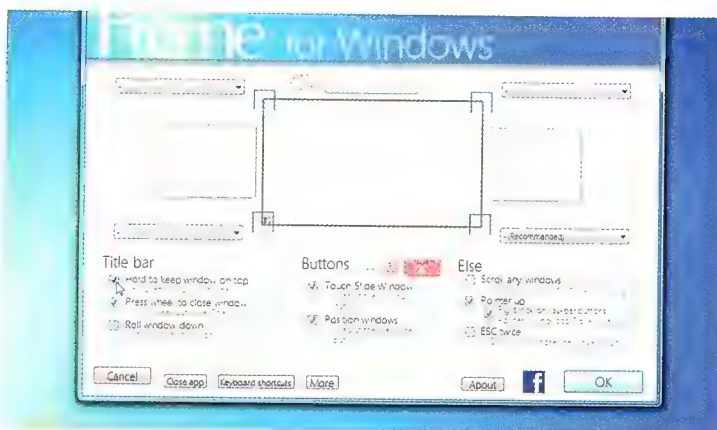
03 THE BASICS

Once installed, Preme will run automatically. You can access it at any time by clicking the star icon in the Windows taskbar to the lower-right of the screen and selecting 'Options'. If you decide you don't like it, you can disable it by clicking the star and choosing 'Off', or close it completely by clicking 'Close app'. Click 'OK' from Preme's main window to minimise it.



04 CORNERED

The big rectangle in the middle of the Preme control panel represents your monitor and the square in each corner lets you choose what happens when you hover your mouse over it. Click the upper-right drop-down menu and choose 'Windows Switcher (Task Switcher)', then hover your mouse over the upper-right corner to see the switcher in action.

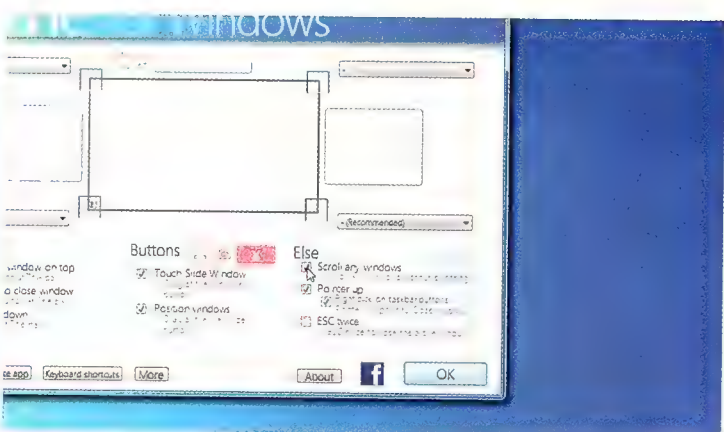
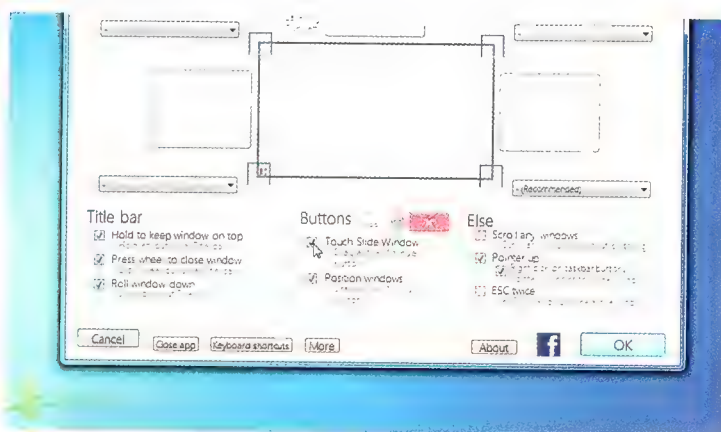


05 TOP WINDOWS

From the drop-down menu, you can also choose to open a file, or hide the currently-active window. Click the '-' button at the top to disable the corners. Under the 'Title' bar you'll find an option labelled 'Hold to keep window on top', which means you can click and hold on the title bar of a window if you don't want it to be hidden by any of the others you have open.

06 WHEELY USEFUL

Here you'll also find an option labelled 'Press wheel to close window', which lets you use your mouse's centre button to close a program, the same way you can close tabs in Internet Explorer. The option 'Roll window down' is nifty, too – you can minimise a window by hovering your mouse over the top and scrolling the wheel downwards.

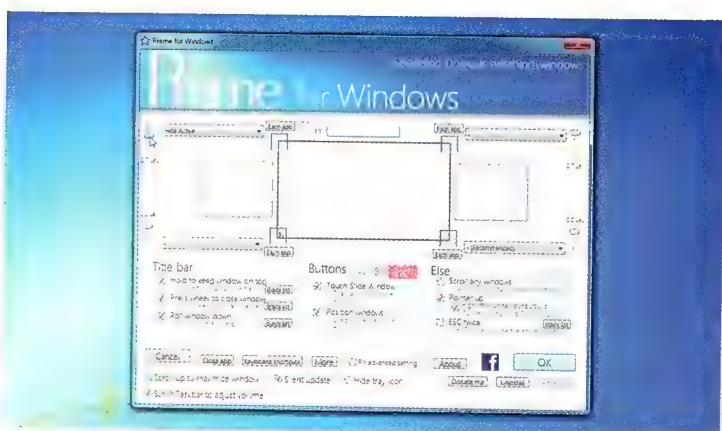
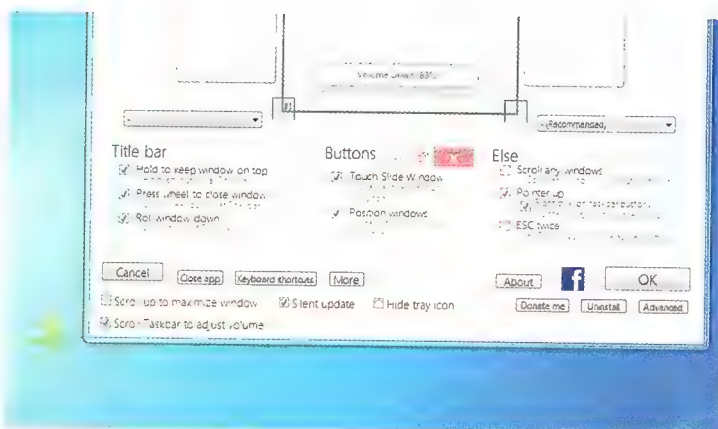


07 BUTTON UP

Enable 'Touch slide window' and then drag the minimise button of an open window to the left or right to fling it off the screen. You can bring it back up by hovering over the relevant side of the screen. 'Position windows' means you can drag on the minimise button to precisely reposition open windows to fill the screen, which is handy if you're using two or more programs at once.

08 POINT IT OUT

Under 'Else' you'll find the option to scroll windows when they're not selected, so if you have two Internet Explorer windows open you can move the inactive one by hovering your mouse and scrolling its wheel. There's also the option 'Pointer up', which makes your cursor jump up to the close window option when you right-click on a window on the Taskbar.



09 MORE

Click 'More' for further options – 'Scroll up to maximize window' lets you hover your mouse over the top of a window and scroll up on the wheel to maximise it. 'Scroll Taskbar to adjust volume' is another incredibly handy setting – by rotating the mousewheel on the Taskbar to the bottom of the screen, you can update Windows' sound output level to a setting of your choosing.

10 PREME NUMBERS

Once you've installed Preme, you'll wonder how you ever lived without it. It's become an essential program on all of our computers. You now know how to set it up and use each and every one of its settings, and you can customise it to your liking. It may take a little getting used to, but you'll soon be flinging and rearranging windows to your heart's content. **BTTC**

apc



On sale now
for only \$6.49



Available on the
App Store

iPad is a trademark of Apple Inc., registered in the U.S. and other countries. App Store is a service mark of Apple Inc.

HTML



PART 12

Build faster web sites

John Allsopp explains how you can create faster web sites using the HTML5 AppCache.

APC EXPERT

JOHN ALLSOPP

With a background in computer science and mathematics – and a great deal of good fortune – John Allsopp's life collided with the web in the early '90s. For nearly 20 years he has developed software for web developers, built web sites and apps, and written books, countless articles and tutorials for print and online publications. In 2000, he wrote *A Dao of Web Design*, which over a decade later continues to be widely cited as the theoretical foundation for Responsive Web Design.

FURTHER READING

Here are some further resources on page performance techniques and AppCache.

IMAGE SPRITES

css-tricks.com/css-sprites
spriteme.org

MINIFICATION AND CONCATENATION

tinyurl.com/ycggcvv
tinyurl.com/3pfcnhk

HTTP CACHING

tinyurl.com/9xnf92b
www.mnot.net/cache_docs

MORE ON THE APPCACHE

appcachefacts.info
www.webdirections.org/blog/get-offline

In the last few instalments of this series we've concentrated on the appearance of sites and apps. However, there's much more to good web design than simply the surface. It's well documented that users quickly (and we're talking fractions of a second) decide on the trustworthiness of a site, so performance counts to 20% traffic loss per additional half-second page load. Reported results range from 1% sales loss per 100 milliseconds additional page load time, which is 10% per second (see tinyurl.com/bhjndh3 for more).

Most of the time taken for a page to load is associated with the network and there are a number of well understood approaches to reducing load times. These include minimising the number of downloads per page (how many JavaScript, CSS and image files do your pages link to?), which we can do by concatenating files; reducing the size of CSS, JavaScript and image files, which we can do by minifying CSS and JavaScript, and using image sprites; and by loading JavaScript at the end of the body of a document, rather than in the head (browsers can stop rendering pages while JavaScript files are downloading, so by loading these last, users get content faster).

There's another way to dramatically speed up the performance of your site, which has the added bonus that it can also work for users when they're not even connected to the net, provided they've visited the site in the past, of course. This is HTML5's Application Cache (or AppCache for short). Let's look at how it works, how you use it and some gotchas you might have to keep in mind when using it.

BROWSER CACHING

You're probably aware that browsers cache (keep copies of)

pages, images and other files they download. That's why pages you visit frequently can seem particularly fast to load. As developers, though, we've got little control over this caching. For those who do have control over their servers, there's HTTP caching, which gives us some ability to affect how browsers cache the resources associated with our pages. Basically, it's up to the browser to decide what to cache and when to throw out cached resources.

ENTER THE HTML5 APPCACHE

The HTML5 AppCache gives developers much more control over what the browser does (and doesn't) cache. We use an AppCache manifest file to tell the browser to do the following tasks:

- what resources it should cache as soon as a page starts loading
- what resources it should never cache, even if it really wants to
- fallback resources to be used when the user is offline and a needed resource isn't cached

With these in mind, let's look at the anatomy of an AppCache manifest file, which specifies each of these for a given page.

THE APPCACHE MANIFEST

In software terms, a manifest is a file that describes a set of related resources – just as for an aircraft, the passenger manifest is a list of all the passengers on board. The AppCache manifest is a text file, which describes the resources associated with a web page or site.

An AppCache manifest *must* start with the string `CACHE`





MANIFEST . It then has three types of sections, each associated with one of the three roles of a manifest outlined above.

CACHE: sections specify which resources the browser should immediately start downloading and caching, and then keep cached.

NETWORK: sections specify resources the browser must never cache.

FALLBACK: sections specify fallbacks for missing resources.

Let's look at each of these sections in turn.

THE CACHE: SECTION

The **CACHE** section specifies the resources (JavaScript, CSS, images, videos, audio, even other HTML files associated with the page) that a browser should immediately start downloading and then keep cached forever (more about this bit in a moment).

We specify these resources by providing a list of URLs, one for each resource we want cached. These URLs can be absolute, such as `http://a0.twimg.com/profile_images/1214807429/APCLOGO200_normal.png` or relative to the manifest file. For example, here's part of a cache section for a possible AppCache for the home page of the APC web site:

CACHE:

`#images`

`http://a0.twimg.com/profile_images/1214807429/APCLOGO200_normal.png`

`http://a0.twimg.com/profile_images/1262984168/Police_K9_GSD_Teeth_3_normal.jpg`

Notice how the **CACHE** section starts with the string **CACHE:** . You might also have noticed that we can add comments for a manifest by starting a line with the `#` symbol. What we've said to the browser is 'please start downloading these images and then keep them forever in your cache'.

So, how does this speed up our site? Well, the first time someone visits, it won't. However, on subsequent visits, all the cached resources are stored locally, ready to be used by the browser. That means all your CSS, JavaScript, images and so on won't create *any* network traffic – they'll load almost instantly from the local file system.

There's another way AppCache can help speed up page loading.

If we include other HTML pages in our AppCache, these will be effectively preloaded so that when a user activates a link to go to one of those pages, it will appear to load much more quickly. Use this sparingly, though. If you try to pre-cache a lot of additional pages at your site, this may put a lot of extra load on the server, since every cached page will be cached the first time a visitor comes to your site. It will also create a lot of work for the browser, which may impact its performance, too.

DO:

- Add commonly used image, JavaScript and CSS files to your cache
- Think about adding a small number of the most commonly visited pages at your site to the AppCache

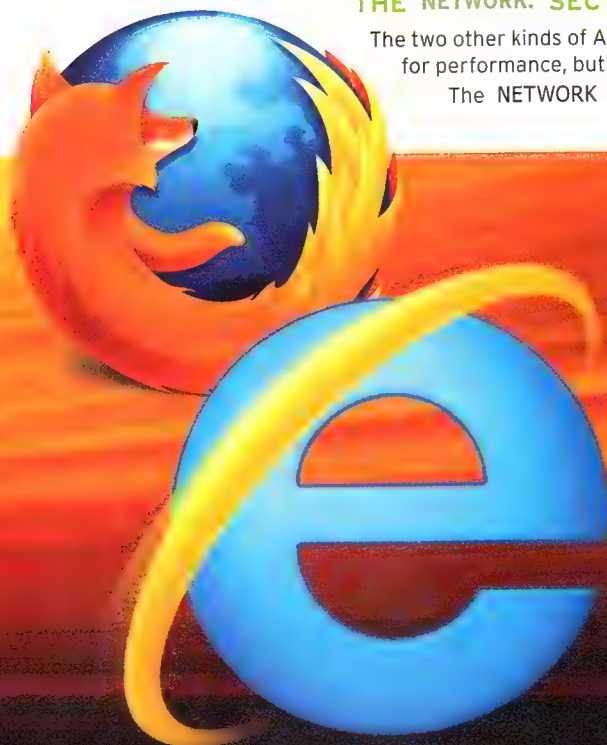
DON'T:

- Mindlessly add every file at your web site to the AppCache
- Remember, it's a trade-off between downloads now and downloads later, each with an impact on performance.

THE NETWORK: SECTION

The two other kinds of AppCache section are less important, particularly for performance, but let's look at these briefly.

The **NETWORK** section specifies resources that you want the





browser to never cache. This means that where a browser might have cached these resources itself otherwise, it must not do this. This is primarily for resources that frequently update, or for which the user must be online to use; for example, a signup or signin page, a page for searching a site and so on.

Unlike the **CACHE** section, where every resource must be individually listed, for the **NETWORK** section we can use a partial URL and then all resources that have a URL starting with the entry will be included. There's also a wildcard, the `*`, which says 'any resources we don't explicitly list in a **CACHE** section should *never* be cached'. There's no requirement to have a **NETWORK** section in an AppCache.

THE FALLBACK: SECTION

The last type of section is for specifying fallbacks for missing resources *only when the user is offline*. What's the use of this? Imagine we have a page with many images. The page has been cached to load quickly, but not all of the images on the page have been cached. We can specify an image to be used for missing images using the **FALLBACK** section of an AppCache manifest, like so:

FALLBACK:

```
http://a0.twimg.com/profile_images/ http://a0.twimg.com/profile_
images/fallback.png
```

Note that here we have two URLs per entry, separated by a space. The first is either a full or partial URL, specifying the resources that should be replaced with the fallback when the browser isn't online and the resource isn't available. The second is a URL, either absolute or relative to the manifest file, specifying the resource to be used in place of the missing one. The browser, when constructing the AppCache for the manifest, will download and cache this resource. Then, when a user tries to visit the site while offline, if the resource isn't cached, the fallback resource is used in its place.

USING THE MANIFEST FILE

We've created our manifest, but how do we actually use it? First, we need to save the file as a text file, with the recommended file extension '.appcache'. We then need to link to this file from our HTML files. We do this using the **manifest** attribute of the **html** element. The value of this attribute is the URL of the '.appcache' file to be used as a manifest for the HTML document.

```
<!doctype html>
```

```
<html manifest="http://a0.twimg.com/manifest.appcache">
```

Now, when a browser loads this page it will see there's a manifest for it. It will fetch that manifest and build a cache for it using that manifest. It's that simple!

Except it's not quite that simple. Read on for some important things you must know about AppCache if you want to use it correctly.

THINGS YOU MUST KNOW ABOUT APPCACHE

There are some subtleties to using the AppCache that if you aren't aware of can create havoc for you while developing a site, as well as after the site is live. Here are the most important gotchas.

The AppCache manifest file *must* be served with a **MIMETYPE** of **text/cache-manifest**. It will be ignored by all browsers if served as any other type. Today, most servers don't serve '.appcache' files with this type.

Files cached in the **CACHE** section are cached forever. If you change the file on the server, the browser won't know, as once a resource is cached, the browser doesn't check for the resource again – it simply uses its cached version. Did I say forever?

We can make the browser rebuild a cache by updating the manifest file. So, if we've updated any of the resources in a **CACHE** section of our manifest, we need to make some change to the manifest file and reupload that to the server. The most common way of doing this is to add a version number as a comment after the **CACHE MANIFEST** string.

However, the user must reload their page *twice* for this to take effect. The reason is logical, but counter-intuitive and one of the many reasons that developers widely consider that 'Application Cache is a Douchebag' (for more information, visit tinyurl.com/agxsm8n).

If even a single resource in a cache manifest is missing, the AppCache won't be built (or if one exists, not be rebuilt). Especially since we can cache across domains, we need to be particularly careful to ensure all the resources in a cache manifest are available. This is a particularly subtle problem.

You don't have to list any HTML pages in the manifest because any page that includes a manifest attribute is automatically included in the AppCache associated with that manifest. That makes sense. But what if we have a page that's constantly updating; for example, a news site? We've seen that to refresh the cache, we need to change the manifest and the user needs to load the page twice, so the AppCache will always be one page version behind! No problem you think,

we'll just add these pages to the **NETWORK** section to tell the browser not to cache these. Sadly, this doesn't override the implicit caching (see why developers think AppCache is a douche?). We can get around this with some JavaScript, but it's far from ideal. The best advice here is not to use a manifest for frequently updated pages.

As we mentioned, all resources must be individually listed in the **CACHE** section to be cached. This includes images used in CSS files. Simply listing a CSS file won't cause any image files referenced there to be cached. Similarly, if you `@import` style sheets into other style sheets, reference images in JavaScript files or there are images in HTML files you include in a manifest, if you want them cached you *must* include them individually in your manifest for them to be cached. This can be tricky, but in a moment I'll introduce a tool I've built to do the heavy lifting for you.

Different browsers and devices limit the size of individual caches (no, a single page can't have more than one cache manifest; nice try, though), so Wikipedia can't simply create an offline version of itself with a very large AppCache. There are several other good reasons why it wouldn't want to.

BROWSER COMPATIBILITY

AppCache is widely supported in modern browsers and devices, including Internet Explorer 10 onwards, Firefox, Chrome, Opera and Safari. In older browsers no harm is done by creating a manifest, so you can safely use AppCache today, keeping in mind all the gotchas.

MANIFESTR, A TOOL FOR CREATING APPCACHE MANIFESTS

Creating manifest files can be a lot of work. Many pages include numerous image, CSS and JavaScript files. I've developed ManifestR (download it from tools.webdirections.org/#manifestR), a bookmarklet you can add to the bookmarks for any browser and then can use on any page to create a manifest file for that page.

ManifestR will find references to any image file, HTML file in the same domain linked to from a page, CSS files linked to, images referenced in those CSS files and JavaScript files linked to for the page, and then construct a manifest file for you. Now that you know how AppCache works, we don't suggest you slavishly use this file as is, but rather adapt it for your needs. Hopefully it will go a long way to making working with AppCache less laborious.

AN ADDED BONUS

We've mostly focused on using AppCache to help improve the performance of a web site, although it has the added bonus of (and was originally designed for) making sites work when the user is offline. Once you've set up an AppCache and a user has visited your site, if they try to return to the site when they aren't connected to the internet, the cached pages and resources will load as if they were. [ETTC](#)



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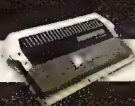
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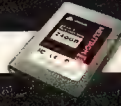
COOLING



MICE



HEADSETS



SOLID-STATE DRIVES

PROJECT 9

Stompy the robot: PART 2

In the last of this two-part project, **Darren Yates** looks at setting up the servo motor leg positioning and modifying the source code for our four-legged walking robot.

DARREN YATES

Darren is a multi-award-winning journalist who started building and testing computers in the early '90s. He's developed a range of PC software, including *PC User's* and *UserBench* benchmark series starting in 2005, its *UserOS* Linux distros in 2008 and is now working on new benchmarks for Android when he's not busy writing or torturing hardware with his soldering iron.

WHERE TO GET THE QUADBOT KIT

We've included the full parts list again, but just quickly, the basic chassis for Stompy is a kit called the Quadbot available for \$55 from Robot Gear (www.robotgear.com.au). It includes the plastic chassis, leg parts and servo motors only – you have to supply the Arduino Uno and Sensor Shield boards, plus all the other electronics.

Stompy is one of the simpler and more compact four-legged walking robots you can build, which makes him a great, low-cost learning tool for understanding a little of the vast world of robotics. Last month, we covered the major pieces – how to put together the chassis and how to assemble the electronics – but now we're looking at some of the more complex parts, including how to get the leg assembly right, wiring up the special DC converter board and how to modify the code to change Stompy's walking speed. Oh, and show off Stompy's new trick.

POSITIONING THE LEG SERVO MOTORS

While some of Stompy's electronics might have seemed a little tricky, the first step before you get there is to make sure you get those servo motors mounted correctly. You have to position the motor assemblies that form each leg so that they have their arc of movement in the right area.

Looking at the front legs from above, the left-front hip – the servo motor attached to the main body – has to swing through an arc from about 1 o'clock counter-clockwise through to 6 o'clock, using a clock face analogy. The right-front hip needs the same arc in reverse – from about 11 o'clock clockwise through to 6 o'clock. If you've built Stompy correctly, the front-right hip segment should run into the battery holder at about 4:30; that's OK because the front leg never swings down that far. The point is to just make sure the hip arc is roughly where it should be.

As for the rear legs, the rear-left hip will also run into the battery holder on its front-going swing, but it should still arc

from about 10:30 counter-clockwise to about 5:30. The rear right hip should arc through from about 1:30 clockwise to 6 o'clock.

The feet are relatively simple to position: each foot segment should arc so that the standing position is halfway through its travel.

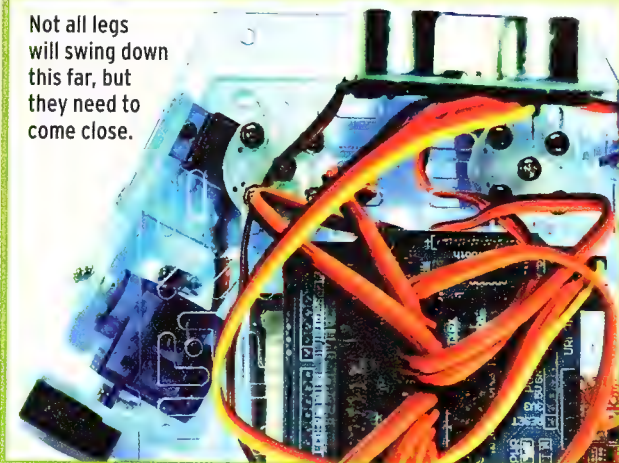
So how do you tell this? You should be able to grab the hip segment and slowly (and gently) move it around while the power is turned off. If the segment motor doesn't want to move, don't force it – the plastic nylon gears in these servo motors will strip easily if you yank them. If the movement arc is wrong, unscrew the motors, rotate the header arm until the motor moves the right way and screw it back into place. And don't worry if the legs don't look symmetrical – since they're made up of eight identical pieces, they'll look a bit odd, but they'll work perfectly well.

LOADING THE SKETCH

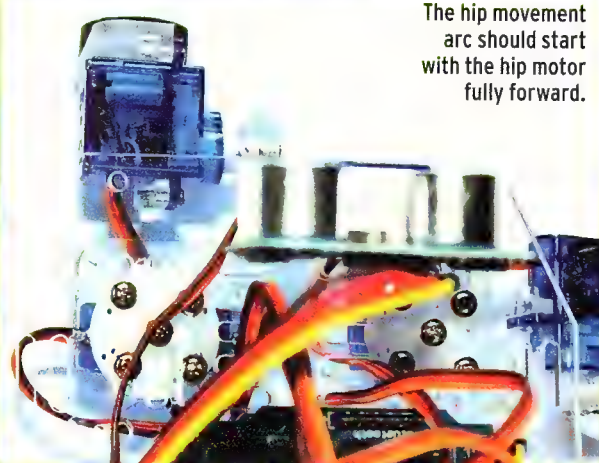
The sketch for Stompy is available from the APC website at apcmag.com/arduino.htm. It contains all of the libraries and code you need. The contents of the 'libraries' folder needs to be copied across to the 'libraries' folder of your Arduino IDE installation. And you must do this before you start the IDE, otherwise you'll need to restart it before the libraries will be loaded.

As for programming the Arduino board, all you need to do is load the sketch, compile it and upload it onto the Arduino through the Arduino IDE. This will get you going at a basic level, but you may find the leg segments still need some

Not all legs will swing down this far, but they need to come close.

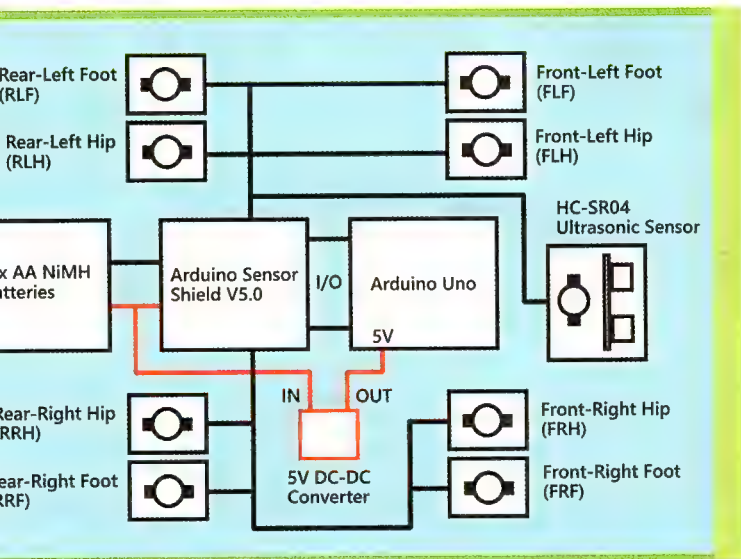


The hip movement arc should start with the hip motor fully forward.



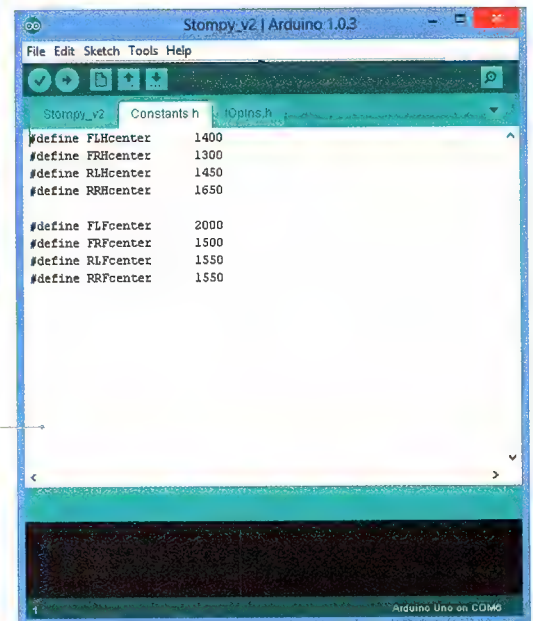


Stompy is built from a \$55 Quadbot chassis available from www.robotgear.com.au.



The 'constants.h' code provides adjustment for leg alignment.

This block diagram shows how Stompy works.



STOMPY'S NEW TRICK

Since I finished the first part of this story, I've been playing around with the sketch. These servo motors come with plastic gears and they get warm, but more importantly, they won't take much rough treatment to wreck. If you do happen to break one, it's no major drama – they're basic 9g servos you can buy on eBay for around \$3 including shipping.

However, I wanted a way to preserve the life of these motors a bit, so after every 20 steps, Stompy will demonstrate his new trick: he'll squat down and sit on his hind legs like a well-trained pooch. While seated, he'll spin his head and have a bit of a look around. After about 10 seconds, he'll spring back up, count to three and continue on his way. The idea is to just provide some downtime for the servo motors, so they're not full-tilt all the time.

SETTING UP THE DC VOLTAGE CONVERTER

As we mentioned last month, a quadbot like this would normally use two batteries: one for the Arduino and another for the servo motors. The reason is the latter work over a limited voltage range that's too low to reliably power up the Arduino board. To fix it, you have separate batteries. We've come up with an unusual solution that allows us to drop the second battery and have just one battery power the whole thing. That's what the little postage-stamp sized DC-DC converter board solves – it provides a constant, regulated 5VDC power supply for the Arduino board from the battery that's (mostly) independent.

The only chore is you need to solder a wire from the 'OUT+' output of the DC converter to the Arduino's '5V' pin. It shouldn't be too hard to do and only needs cheap hookup-grade wire – just keep your soldering iron tip clean, tin the wire (twist the wire strands and give them a lick of solder beforehand) and it should solder quickly and easily. If you're nervous about heat damaging the Arduino chip, use your needle-nose pliers and lift the DIP chip out of the IC socket, do the solder joint and put the chip back the way you found it.

Before you power things up, make sure you remove the little jumper header next to the DC input terminal block on the Sensor Shield. This electrically separates the Arduino from the Sensor Shield so that the Arduino can be powered by the DC converter and the Shield by the batteries directly without conflict.

Unfortunately, there are two types of this Sensor Shield board available: one without the jumper and one with. You need the one with the jumper, otherwise there's no way to electrically separate the voltage

alignment. Provided you've followed the basic movement arc guidelines above, the legs might not be perfectly aligned, but they should be reasonably close. What you'll likely find is that depending on the positioning of those motors, Stompy's standing position might be out of alignment.

SETTING THE STANDING POSITION ALIGNMENT

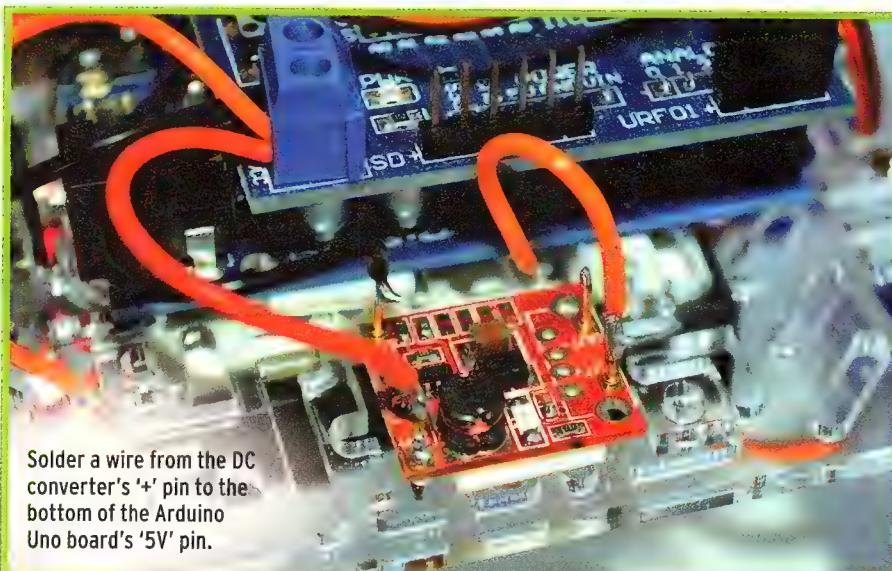
After you've loaded up the sketch into the Arduino Uno board, turn on Stompy's power switch and the first thing that should happen is Stompy stands to attention, with all hips at right angles to his body, feet pointing straight ahead, ready to begin walking.

As soon as he's in the 'attention' position, turn the power off. Remember how we said that it didn't matter if your motor positioning wasn't millimetre perfect? Here's how you fix it.

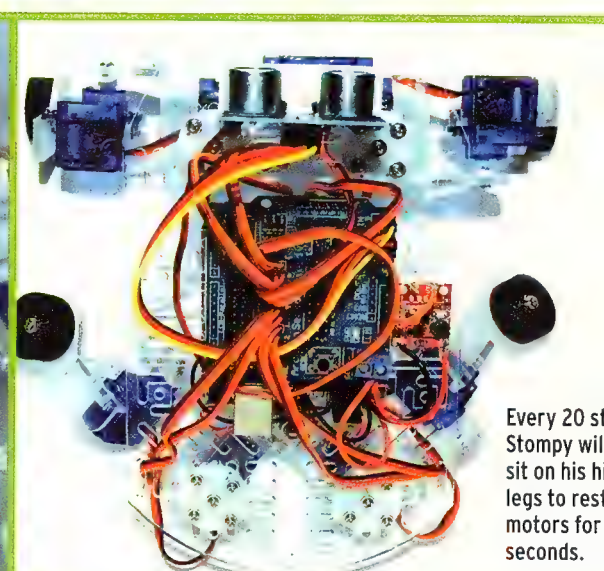
In the Stompy sketch, there's a header file called 'constants.h'. It should be the second tab on the IDE when the Stompy file is loaded. There are eight constants here, which are the centre positions for each leg segment. The letter code is: 'F' for front, 'R' for rear, then 'L' for left, 'R' for right, and finally 'H' for hip and 'F' for foot. For example, 'FRH' stands for 'Front Right Hip'. By changing the value of each constant, you can adjust the standing position of each leg segment.

Make the constant number larger and it should move the servo motor further up; make it small and it should go down. The simple trick is to adjust them until you get the motors shifting so that Stompy is in perfect alignment – feet pointing straight ahead and the hips at right angles to his body direction.

Another tip is to carefully hold Stompy as the legs move and watch how his feet move. You want them to just fractionally curl under his body, so when he stands, the legs will just bow slightly under the weight and he'll stand straight. Again, you do this by adjusting the appropriate numbers in the 'constants.h' file.



Solder a wire from the DC converter's '+' pin to the bottom of the Arduino Uno board's '5V' pin.



Every 20 steps Stompy will sit on his hind legs to rest his motors for 10 seconds.

rails and without that, it won't work. Thankfully, most are now the jumpered type, so make sure you get one of these.

CHANGING STOMPY'S WALK SPEED

Stompy's gait is designed for speed. Basically, the left-front and right-rear legs take a step as a pair, just as the right-front/left-rear pair do. For more stability, there's a more complex gait you can try that moves one leg at a time, but it involves you leaning Stompy to the opposite corner of the leg you want to move. That's to shift the weight and allow Stompy to balance on three legs while he moves the other. This gait is more suited to rocky terrain and as you'd expect, it's quite a bit slower. We haven't coded it here and we'll leave it as an exercise for you to try if you're interested.

The simpler option for changing how fast Stompy walks is to simply change the speed or more precisely, increase or reduce the delay time between each leg segment move. This is the part of Quadbot designer Russell Cameron's original code we've kept intact because it was brilliantly simple. It works by using a series of small delays between each leg movement that's controlled by a single integer variable called 'time', which you'll find right up at the front of the Stompy sketch.

By default, the variable is set to 90 (as in 90 milliseconds). To speed up Stompy's walk rate, you just reduce the number in that variable down to 80 or 70. To slow him down, increase it to 100 or 110. However, don't reduce it too much – try to make Stompy walk too fast and he'll probably blow a hip joint trying to keep up with what his 'brain' is telling him.

The servo motors can only move so fast and you need to keep the delay time long enough to allow for the full extension of the foot or hip movement to be reached to ensure he takes proper steps. That takes a minimum amount of time – try changing the 'time' variable yourself and see what effect it has. Of course, the other thing is the faster you go, the quicker you'll drain the battery.

BATTERY LIFE

And that brings us onto something we didn't talk about last time: battery life. With a set of four 2,000mAh NiMH cells, Stompy should get around for at least an hour, possibly more, depending on how much walking into walls you make him do. Basically, the more physical resistance the motors are subjected to, the more power they pull and the more likely they are to be damaged if you do it long enough.

The DC converter and the low power consumption of the Arduino Uno board itself ensures the servo motors will slow down long before the Arduino board shuts down through lack of supply voltage. The DC converter should continue to work until its input voltage from the battery drops down to around 2VDC – by that time, the four NiMH cells will be as dead as a doorknob anyway and the motors long stopped. Battery cell voltage also tends to fall off a cliff as the battery is exhausted, so you'll probably find Stompy just stops dead somewhere in the middle of his travels.

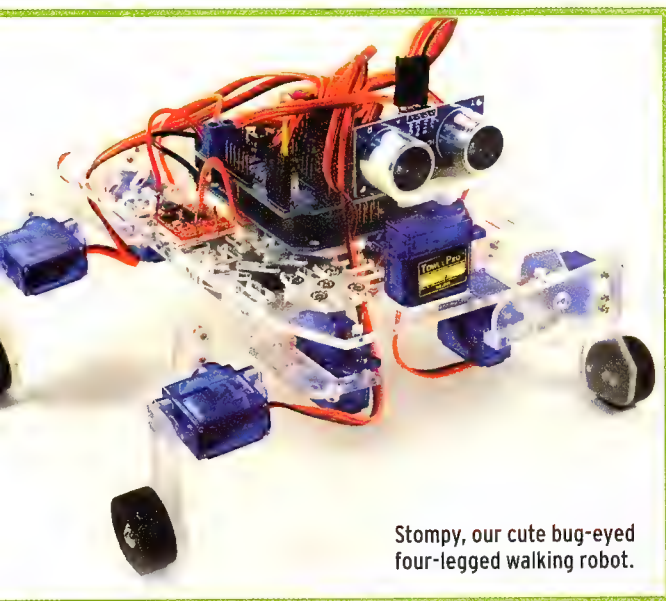
And remember, don't use standard 1.5V alkaline cells in Stompy – the higher combined 6.4V (most cells are 1.6V initially) voltage from these

STOMPY THE ROBOT: PARTS LIST

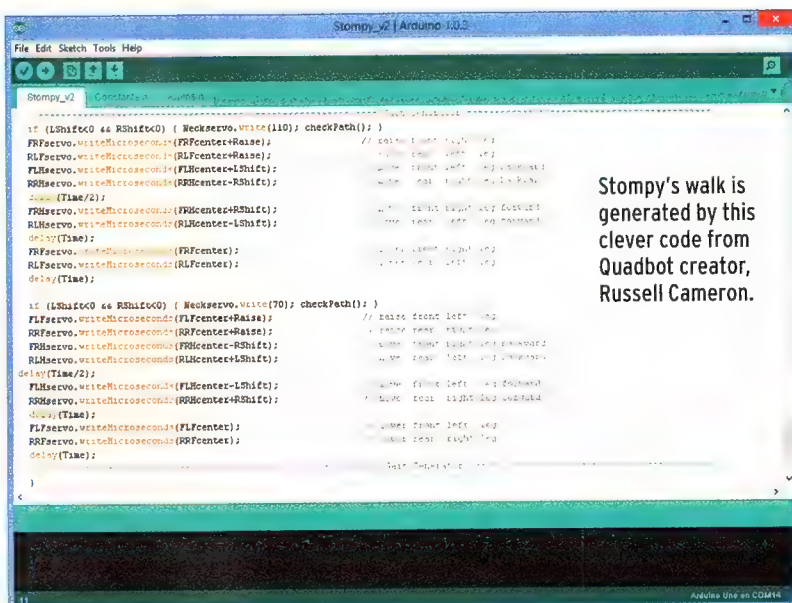
PART	COST	SOURCE
Arduino Uno R3	\$13.20	tinyurl.com/mhl3xq7
Arduino Sensor Shield V5.0	\$4.86	tinyurl.com/d6qkhev
Dagu Quadbot chassis kit	\$55.00	tinyurl.com/dyx6ewt
DC-to-DC converter	\$3.03	tinyurl.com/cxaez45
SPST toggle switch	\$1.95	tinyurl.com/c86rh6j
HC-SR04 sensor	\$1.88	tinyurl.com/bsewdxt
TowerPro SG90 servo motor	\$2.62	tinyurl.com/bncsnp5
TOTAL COST	\$83.29	

SERVO MOTOR

Servo motor	SHORT FORM	SHIELD JUMPER SET
Front-left hip	FLH	5
Front-left foot	FLF	4
Front-right hip	FRH	6
Front-right foot	FRF	7
Rear-left hip	RLH	9
Rear-left foot	RLF	8
Rear-right hip	RRH	11
Rear-right foot	RRF	10
Neck	N	3



Stompy, our cute bug-eyed four-legged walking robot.



Stompy's walk is generated by this clever code from Quadbot creator, Russell Cameron.

cells will swamp the DC converter and potentially apply too much voltage to the Arduino's ATMEGA328P microcontroller chip and damage it.

BUILDING YOUR OWN

Of course, there's nothing stopping you from using our sketch as the basis for your own walking robot made out of whatever parts you wish. Keep in mind that the code is designed for what are called two degrees of freedom (2DOF) designs like ours, where each leg is made from hip and foot leg segments. Remember, the Arduino Uno has a limited number of digital outputs – if you want a six-legged 3DOF spiderbot, for example (which requires 18 outputs minimum), you'll need to consider another microcontroller, such as the larger Arduino Mega.

One fairly simple way you could improve the existing design is to swap out the plastic-g geared servo motors for metal-g geared ones. This would give Stompy considerably more strength as he stands and walks and even give him better endurance. However, to use the existing plastic chassis and leg mounts, you'd have to make sure those metal-gear servos fit the leg screw mounts. We'll leave that up to you.

The good thing is that using Arduino puts you in the designer's chair. You can bend, mould and shape the project to fit your own imagination, since you have the source code to muck around with yourself.

SIMPLIFYING THE DESIGN

You could also simplify the design by just getting rid of the neck servo motor and mounting the ultrasonic sensor directly to the front of the body plate. This will affect Stompy's ability to see obstacles just off his eyeline – if they're not right in front of him, he won't see them, so chair legs and the like will be a problem.

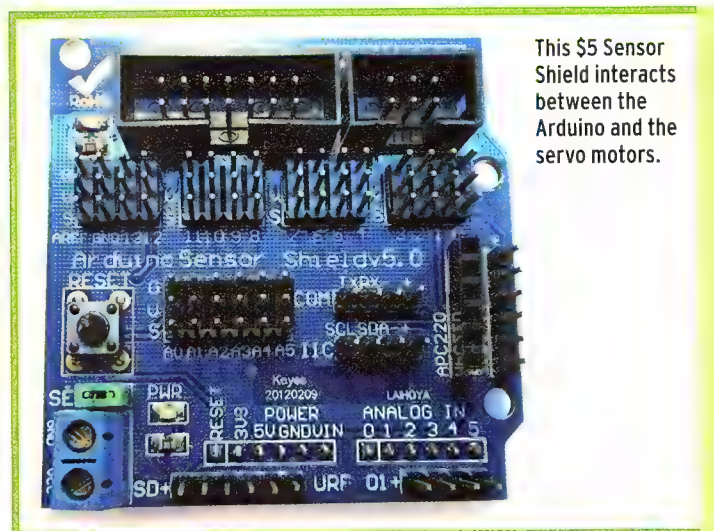
You could also use two batteries if you wish: a 9V battery to power the Arduino (plug it in via the DC socket – you can buy battery snap-to-plug adapters on eBay for \$2) and the four AA cells to handle the servo motors. The benefit of this is you could then use standard alkaline cells if you wish and you can ditch the DC converter board. Personally, I prefer the single-battery solution, but the choice is yours. None of these changes require any modification to the sketch code.

I'm continually amazed at just what you can do with an Arduino Uno board and its tiny 32KB of programming space. And we're not done yet.

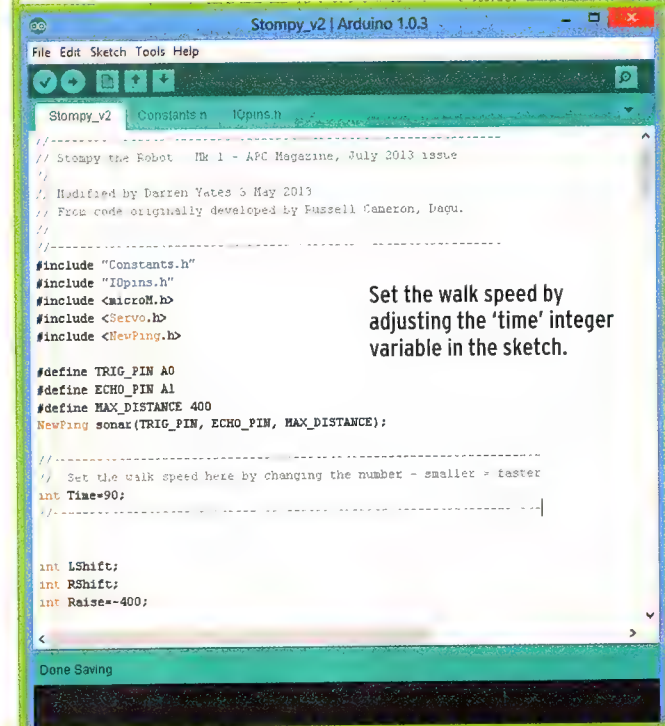
NEXT MONTH

Over the next couple of months, we'll start taking a closer look at how to network an Arduino Uno board. We'll look at how you can control it wirelessly using a smartphone and we'll even get your Arduino talking to the world via Twitter.

Yep, we'll show you how to get your Arduino its own Twitter account, use the new Twitter REST 1.1 API and automatically send tweets. If you're struggling for useful ideas on what you could do with a self-tweeting device, take a look at my Arduino account (@IAmArduino). [ETPC](#)



This \$5 Sensor Shield interacts between the Arduino and the servo motors.



Set the walk speed by adjusting the 'time' integer variable in the sketch.

ROM CUSTOMISATION

Bake your own Android ROMs

In this first part of a new series, **Darren Yates** begins looking at how to customise your own ROM, starting with an introduction to virtualisation and the Android Kitchen.

YOU'LL NEED THIS

ANDROID KITCHEN

xda-developers.com has all the info you need.

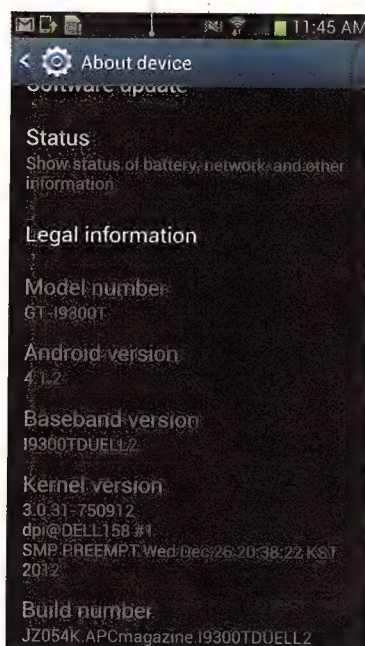
VMWARE PLAYER 5

Grab the latest version from tinyurl.com/m98uf75.

XUBUNTU

Get the 32-bit 13.04 ISO image from tinyurl.com/14o5ron.

Our special **APC** magazine Galaxy S III ROM build.



You know you're a hardcore Android user when you buy a new smartphone and your first thought is to see if there's a CyanogenMod ROM available for it yet. Custom ROMs have become a bit of an underground industry as users worldwide look to try and ditch the corporate bloatware and create a lean phone experience.

CyanogenMod would easily be the most well-known community ROM maker and it has a brilliant track record of being able to create incredibly lean ROMs at a fraction in size of their stock corporate counterparts. But as good as CyanogenMod is for shrinking ROMs, sometimes the cost can be a bit high. CyanogenMod is based on the Android Open Source Project (AOSP) – if you like, a vanilla version of the latest available Android release. However, it means the CyanogenMod team has to build a custom version for each phone, baking in the device drivers for each phone's functionality, and it doesn't always include everything. For example, a recent CM10.1 ROM I loaded into my Galaxy S III didn't support MHL (Mobile High-definition Link), so I lost the ability to watch Netflix on my big-screen TV from my phone. As much as I wanted to use CyanogenMod, losing my big-screen video streaming was a bit of a deal-breaker.

Generally, there are two ways you can create a custom ROM for your phone: you can start from scratch with AOSP or you can build on an official stock ROM and customise it yourself. AOSP is a lot of work, so props to CyanogenMod for the work it does, but we're going to look at how to create a custom ROM from a stock release and at the same time, introduce you to the Kitchen.

GETTING INTO THE KITCHEN

Customising a ROM is a complicated process on one level, but on another, it's like working on a multi-layer ZIP file. In a nutshell, you extract a ROM's contents out of its archive into a working folder, remove the ROM parts

WARNING!

Customising your own ROMs can be potentially hazardous to the health of your smartphone. Be warned: an incorrectly built ROM may brick your phone. We present this information having tested it ourselves, but offer no warranty on its fitness for use. Use it at your own risk.

you don't want (the bloatware) and make any other changes you want (root access, for example), stitch the ROM back up and archive it. We're grossly simplifying it, but that's roughly what you do. You can choose to do all of this by hand, although in the Aladdin's cave that is the XDA Developers forum (xda-developers.com), you'll find a very convenient tool to help simplify the process. It's called Android Kitchen.

Android Kitchen isn't going to turn you into a ROM god overnight, but even if you never actually flash your phone with your own customised ROM, it'll still open up the world of ROM development and give you a taste of how Android works underneath. That said, I've now used it to create custom ROMs for a number of devices – my now-deceased HTC Desire (deceased because I dropped it) and my Galaxy S II and S III. So if I can do it, how hard can it be?

PHONE SUPPORT

There are a few 'kitchen' tools available but Android Kitchen is one of the best around and has a surprisingly good list of supported phones, including (but not limited to):

- Samsung Galaxy S/S II/S III/S4
- Samsung Galaxy Note/Note 2
- HTC One/S/X/XL/V

For the full list of supported phones, check out tinyurl.com/yf5akea and search out the device support in the first post. Android Kitchen is now under part-time development yet it still covers most of the popular phones released over the last couple of years.

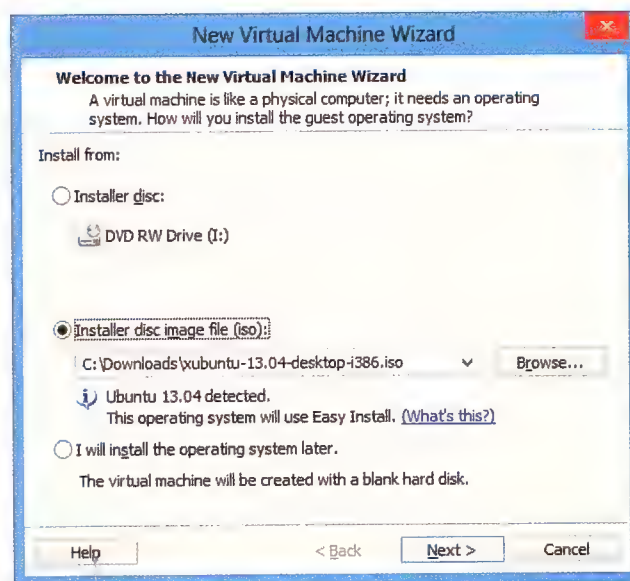
There's a way to add other phones not listed in the compatibility list, but that's beyond the scope of this series for now. Still, if you have one of these supported phones, you have the potential to create your own custom ROMs with Android Kitchen.

BUILDING THE PLATFORM

Before we start, the first thing we need is a development platform – Android Kitchen is a Java-based Linux console app that works in Mac OS X, Linux or Windows. To use Windows, you need to create a Cygwin environment first. Cygwin is a set of tools that creates something of a Linux environment and



Samsung's Galaxy S III is one of a number of phones supported by Android Kitchen.



Create a VMware Player virtual machine from an ISO image or Live CD.

Make up a username and password – and don't forget them!

includes a Linux API (application programming interface) to allow some low-level Linux code to run under Windows. As Cygwin itself is keen to point out, it's not a way to make Windows aware of Linux's peculiar ways or to run Linux apps natively on Windows.

The problem with Cygwin, however, is that it can have problems with symbolic file links that often exist within ROMs and can occasionally muck up, which is a bit disastrous for you if you're trying to make a ROM to run your phone. The last thing you want is a flaky ROM. Android Kitchen app developer [dsixda] has done plenty to make the app work as well as it can under Cygwin, although we think the safer option, and the one we'll go with, is to use a native Linux system. [dsixda] recommends Ubuntu and we're using Xubuntu, which is almost the same thing, just a bit smaller and uses the old school Xfce desktop, which is a little more Windows-like.

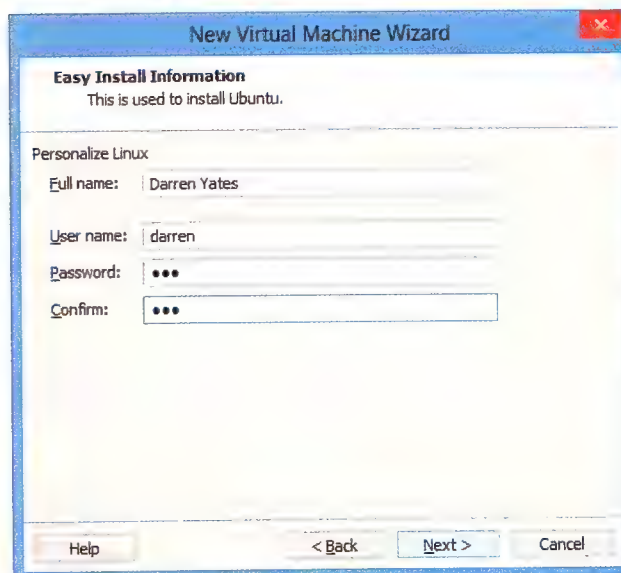
CREATING A VIRTUAL MACHINE

If you already have a Linux computer ready to go, that's great. If not, rather than build a separate Linux box, we'll recommend you cheat and go with virtualisation. Using VMware Player 5.0.2, we'll build an Xubuntu 13.04 virtual machine (VM) that runs as an app on your existing Windows computer. You'll need your computer running at least Windows XP SP3 or later, then grab the latest version of VMware Player 5 from tinyurl.com/m98uf75 and follow the instructions to install it. Don't do anything else with it for now.

Next, you need a Linux distro. We've had a couple of these over the last year or so on our APC cover discs, but really any Ubuntu-based distro will be fine – it doesn't have to be the latest release. If you don't have anything, grab the 32-bit Xubuntu 13.04 ISO image from tinyurl.com/14o5ron. It's 827MB and we'll use this to build a complete Xubuntu Linux VM that you can use to run almost any Linux software. (You can use the 64-bit version, but for our needs, the 32-bit option will be simpler and we'll use this instead.)

VM REQUIREMENTS

VMs run in software, but they need real hardware to work – you'll need a



PC with at least 3GB of memory (preferably 4GB) and a minimum of 40GB of drive space free. Using VMware Player, we're now ready to build a VM with 1GB of RAM and 20GB of hard drive space. That's enough room to install Ubuntu Linux, the Android Kitchen and make a couple of ROMs. It's also enough RAM to ensure Ubuntu (known in this virtualisation setup as the guest operating system) runs well enough without compromising Windows (the host).

CREATING AN XUBUNTU VM

To begin, fire up VMware Player and click on 'Create a New Virtual Machine'. This will launch the setup wizard that will guide you through the process.

howto ● android masterclass

The first step is to point VMware Player to your Linux distro – it can either be an ISO image you've downloaded or grabbed from a cover disc, or a Live CD/DVD if you've already burned it to disc. Choose your option, set the location to the distro and click 'Next'. On the next screen, add details to create a local account with a username and password – these will be used automatically during the installation process. Make sure you write down the username and password, as you'll need them later. When you're done, click 'Next'.

On the 'Name your Virtual Machine' screen, call it whatever you want, but the more important setting to take note of is to decide the folder location you want to store the VM files in. The Ubuntu OS files are installed into what's best described as a self-expanding ZIP file – it sits on your computer as a single file that expands as required. The important thing is the installation is separate from your Windows install. It obviously loads onto the hard drive, but to Windows, it just looks like a big compressed archive file. So, choose the location you want to use to store the files wisely (it should have about 30GB free) and hit the 'Next' button.

Now, choose the disk space you want to allocate to the VM – we recommend 20GB. Also, set the virtual storage as a single file, not split files. When you're done, click 'Next' again.

On the final 'Ready to Create Virtual Machine' screen, you'll get an overview of the settings to be used. You can even change them if you click the 'Customise Hardware' button, although there shouldn't be any need to. When you're done, click the 'Finish' button.

INSTALLING XUBUNTU

The VM will then launch and automatically begin installing your chosen Linux distro. The installation will take around 20 minutes, depending on your system and how many updates it needs (or you choose) to download. When it's completed, you'll not only be ready for Android Kitchen, you'll have a Linux computer on your Windows desktop that you can fire up and run both at the same time.

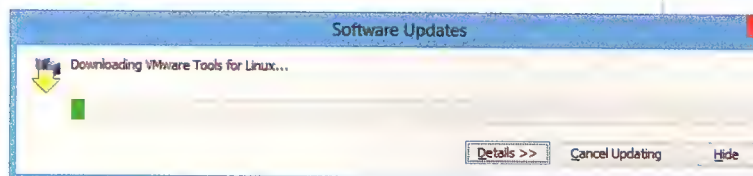
One tip: make sure you select to download and install the VMware Tools for Linux app when the pop-up box appears. Ubuntu won't start correctly until it's installed. Once it's in, restart the VM (in the top menu, go to 'Player > Power > Reset') and the VMware Tools app should automatically install. Eventually, your Ubuntu install should kick up, ask for your password and load up the desktop. When you see that, your VM is up and running.

Before we go any further, if you've not used Linux before, have a play around and get used to the controls. Launch the web browser (Firefox) and you should be able to head to your favourite web site and browse. Load up Thunar – Xubuntu's Windows Explorer equivalent – and get used to folder navigating. Take your time here, as it's better to learn how to navigate your way around at leisure than try to find something in a panic later on.



Xubuntu 13.04 installing as an app on a Windows 8 PC

Make sure you install VMware Tools, otherwise Linux won't start.



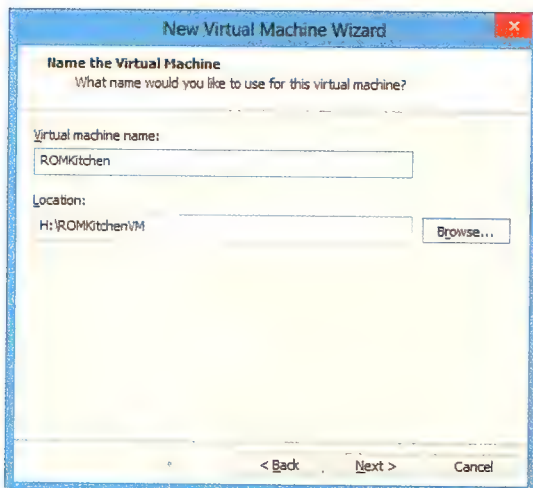
INSTALLING ANDROID KITCHEN

When you're ready, the next step is to install the Android Kitchen and we'll be working exclusively within the VM from now on.

The first step is to launch the 'Ubuntu Software Center' and in the search box on the top-right, type `Java`. Select the latest 'OpenJDK Java Runtime' option and install it. When it's done, launch a Terminal box ('Menu > Accessories > Terminal Emulator') and type `java -version` to ensure it's installed. Launch your Linux browser and head over to tinyurl.com/93rw8h5 to download the latest version of the ROM Kitchen (at the time of writing, this was version 0.224). Click on the zip icon and download it – it'll be about 27MB and should make its way to your `/home/<username>/download/` folder.

Once it's downloaded, extract the files and you should end up with an `Android-Kitchen-0.224` folder or similar for your version. Now, in your user folder, create a new folder called 'kitchen' and copy the contents of the 'Android-Kitchen-0.224' folder into that new folder. You should end up with a `/home/<username>/kitchen` folder and inside you should see subfolders 'original_update', 'scripts', 'tools' and a 'menu' file.

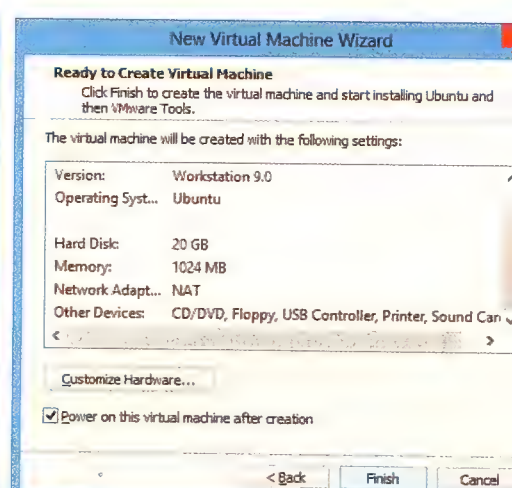
Another tip: it's important that the full path of the Kitchen folder has no spaces – 'darren yates' is bad; 'darrenyates' is good – otherwise the Kitchen won't work properly. If your username has spaces, create the 'kitchen' folder in the 'home' folder and copy the contents there.



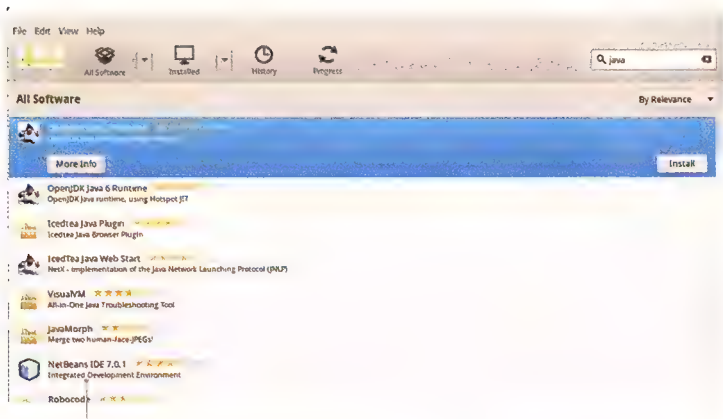
Make sure you choose a storage location with lots of space.



You need to allocate 20GB of space to your VM to make it work.

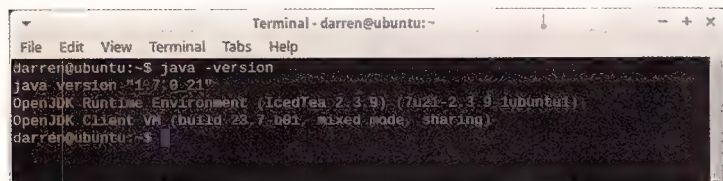


Check the details and you're ready to make your VM.



Android Kitchen needs Java; you'll find it in the 'Ubuntu Software Center'.

Use Terminal to ensure Java installs properly.



RUNNING THE KITCHEN

If you're using Xubuntu, right-click the 'kitchen' folder in the Thunar file manager and select 'Open Terminal Here'. This is a quick way to launch a Terminal screen that automatically opens in the 'kitchen' folder. Type `./menu` and press Enter. You should then see the Android Kitchen menu appear on the screen. If so, congratulations – you're just about there.

FINDING ROMS

Before we can start cooking ROMs, we need a ROM to start with. Just for this example, we'll use the latest Android Jelly Bean (4.1.2) ROM for the Galaxy S II I9100 smartphone. If you have a Samsung phone, Sammobile (sammobile.com) is about the best place to grab stock ROMs. The sample ROM file we're using as it was downloaded is 'i9100xwls_h_i9100opslsb_ops.zip'. Copy that file to your `/home/username/downloads/` folder.

Now we get to a slight bump in the road. There are a number of ways phone ROM archives can turn up and you have to treat each one differently. Most Samsung ROMs come as ZIP files with a '.TAR.MD5' archive inside. Grab this file and copy it to the Kitchen's 'original_update' subfolder. Use the Thunar file manager to rename the file and drop the '.MD5' extension, so it just becomes a TAR file.

Head back to the Terminal with the Kitchen app running and select 'Option 1' – we need to create a working folder for our customised ROM. Use the default working folder option provided and press the Enter key to continue. Android Kitchen should then show your ROM file in its list of 'Available ROMs'. Select the ROM number and press Enter. Android Kitchen will begin expanding the ROM into the working folder, ready for us to start customising.

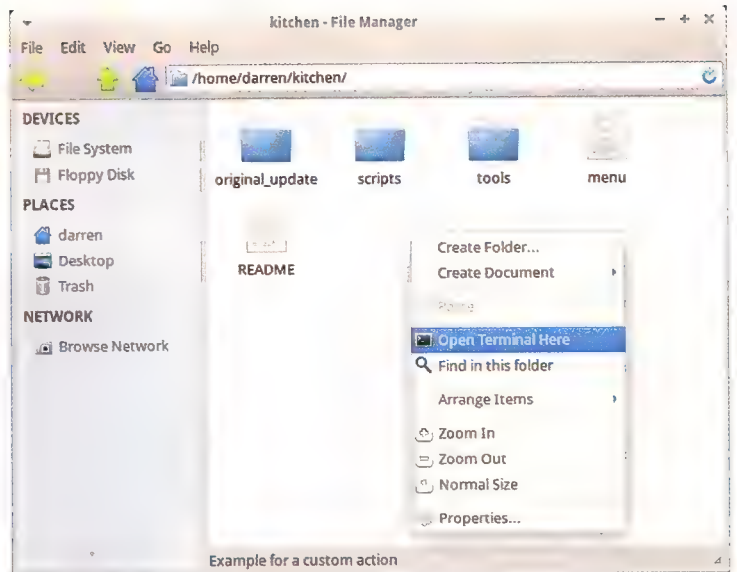
When it's done, you'll have the option to see an information panel about the ROM, including whether it already has root access and other useful extras.

NEXT TIME

We now have the Android Kitchen up and running and our stock ROM expanded, laid out and ready for customising. Next time, we'll start looking at the various options such as how to root the ROM, enable installation of apps to the SD card and even add the option of customised boot animation. And not to mention how to ditch some of that pesky bloatware!

In the meantime, get familiar with your new Linux VM. With the VMware Tools app installed, you should now be able to copy and paste files from Windows to Linux with a simple Ctrl-C/Ctrl-V flick. [BUT](#)

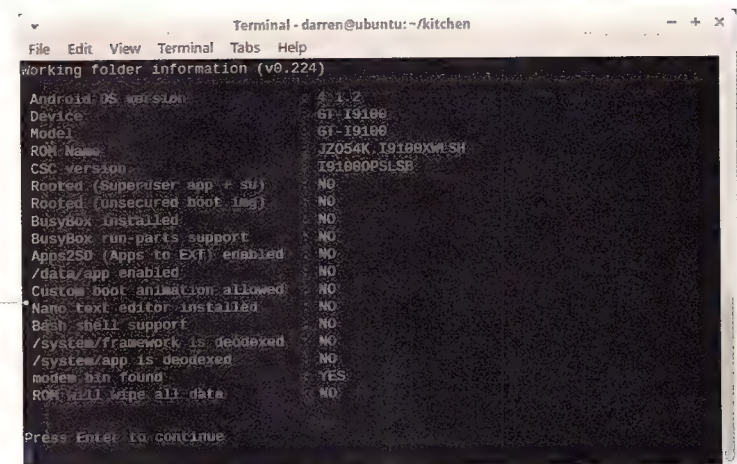
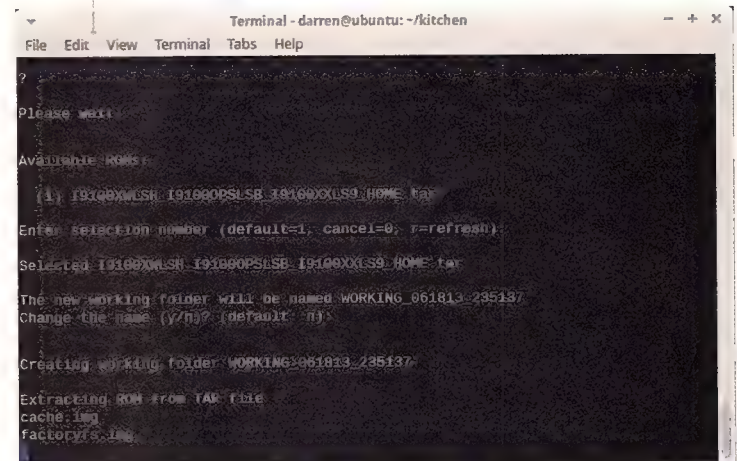
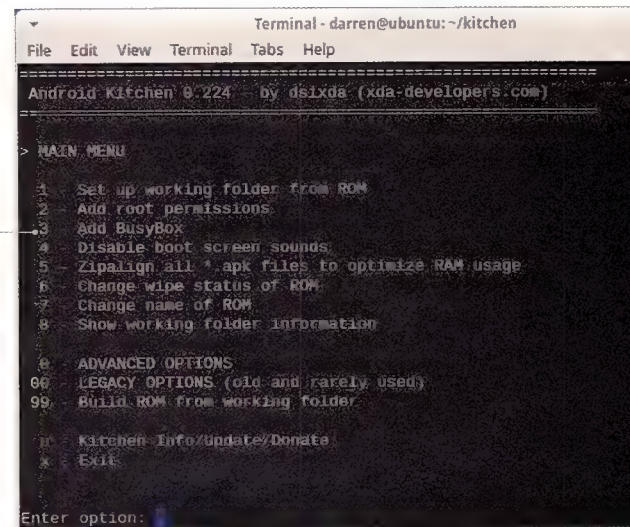
After expansion, check the info page for ROM details.



Create a separate 'kitchen' folder in your /home folder.

The Android Kitchen menu: everything you need to customise a ROM.

The first step is to expand the ROM into a working folder.





Company of Heroes 2

Enjoy the horrors of the Eastern Front in the latest RTS offering from Relic Entertainment.

PC

@ www.companyofheroes.com

\$ \$78

This may be called *Company of Heroes 2*, but it's a long way into the 15-hour campaign before Relic's real-time strategy game finds any heroism. Set on World War II's frigid Eastern Front, it's more concerned with rifle-butting home the horror of the bloodiest sector of the conflict than heroism. The Eastern Front saw the brunt of the war: Germany lost 80% of its Wehrmacht casualties east of Berlin; the Soviets themselves lost some 26 million souls overall, 8.6 million of whom were military. Learning about this is harrowing; playing it is, too. The Soviet war effort hinged on the country's ability to spit out prodigious amounts of young men and women to fight and die for their motherland. This quirk of population translates to the games as giving you a near-endless stream of people you could click on to send to their doom. In most missions, squads can be trained at your home base or brought into battle as conscripts. This second type of soldier gives *Company of Heroes* its Soviet tinge and can sometimes make it unsatisfying to play.

Flitting between skirmishes and managing 135 tiny humans can be quite draining, especially when attempting actual tactical manoeuvres. To avoid coming out of the campaign with PTSD, we found it easier to simply roll our forces into a ball – toughest units clustered at the middle, fleshy conscripts on the outside – and smash through enemy positions. Any lost conscripts could be replaced in seconds, and any lost soldiers could be, too: conscripts have the ability to join up with a depleted squad to take them back up to their maximum complement.

While historically accurate, trying to drown your opponent in your own soldier's blood isn't a particularly satisfying strategy to play out in a real-time strategy game.

Company of Heroes 2's worst missions feel like they're backwards: instead of playing the plucky, clever underdogs, you're upgraded to the role of military colossus, infinite resources hurled at the brick wall until sheer erosion cracks a hole. It suffers most as a game when it's trying to tell its weighty story. Cutscenes tell the tale of Isakovich, a soldier turned journalist who documents the heroism of average men and women sent to their deaths. It's a worthy and true tale – one of traitors and egotists killing their own people – but it's almost entirely undone by cutscenes that look like they were actually made in 1945. The historical poignancy is there but it staggers under clumsy delivery methods. The burden of history weighs particularly heavily on the early quarter of the campaign. With the Germans pushing into Russia, the Soviet forces are in full retreat, meaning many missions aren't won so much as vacated. One asks you to flee the map, burning villages as you go. Another cast us into one final Soviet-held capture point with a broken and scattered force, before flashing up our next objective to hold out against waves of enemies.

Another level deposited us and a handful of ill-equipped conscripts in a freezing town, asking us to take down a near-indestructible Tiger tank with ingenuity and planning. This mission made good use of *Company of Heroes 2*'s true line-of-sight: without eyes on our tanky



target, we were left bumbling around in the utter cold. After a few of our squad were mercilessly squished under its 70-tonne tracks, we began to lay down tripwires and traps. Eventually crippling the big lump caused a real-life fistpump, a gesture repeated when we got to shoot its driver, commandeer it, patch it up and drive it home. These levels show *CoH2*'s moving parts working to drive the war forwards. They don't always do that, though. The game is loaded with half-explained and unintuitive systems. Four resources – manpower, fuel, munitions and population cap – determine whether you'll be able to call in new troops and vehicles.

Even better are *CoH2*'s Theatre of War missions. These are focused fights split into three categories: co-op scenarios, solo challenges and AI battles. Where Isakovitch's campaign story spans 14 missions, the Theatre of War has 18 missions for 1941 alone split between the German and Soviet sides. Where the main campaign can be bloated, these missions are exhilarating in their singular focus and multiple options. We played one solo challenge that asked us to level German buildings with long-range Katyusha rocket trucks supported by a small contingent of troops. On our first go, we careened around the map, launching barrages before sacrificing squads to allow the Katyushas to escape. On our second attempt, we worked out a solid firing solution and parked up in the middle of the level, able to rain rocketry-doom down on the marked buildings as our dug-in conscripts kept our Katyushas firing. Both attempts were successful.

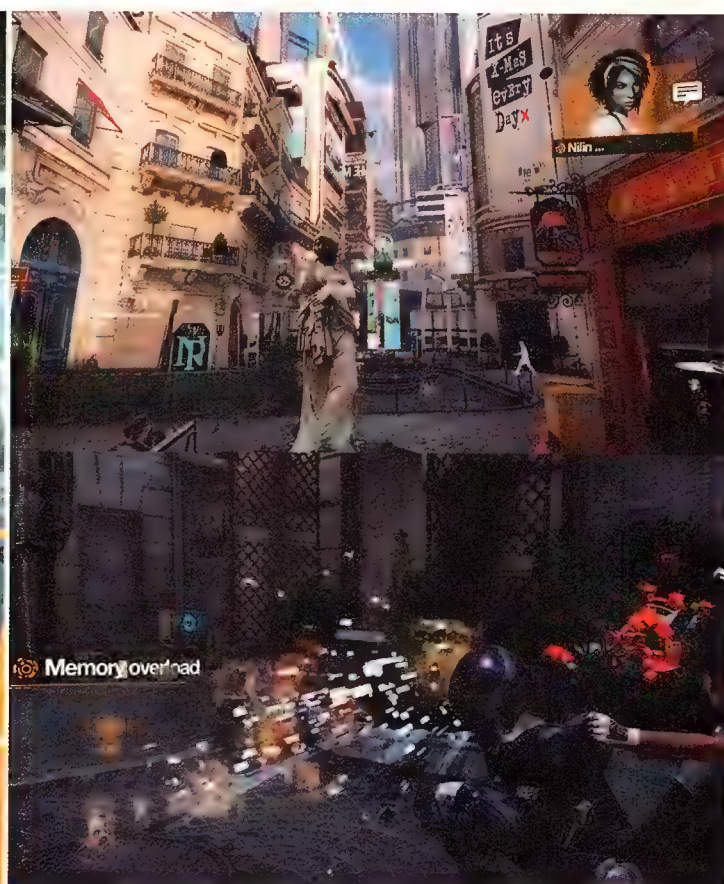
Co-op missions are similarly freeform. Both generals can choose to mix and match similar forces and push together on their objectives, or to coordinate and specialise. This is *Company of Heroes* as an aggressive kid's toy box, allowing you to either pull out your favourite soldiers to win the fight your way, or asking you to battle back against almost-overpowering odds in a way the campaign rarely does. We found most of the character and cleverness that was missing from *CoH2*'s campaign mode in these Theatre of War missions. We found more in the game's multiplayer: replacing the game's slightly wonky AI with real humans makes for ludicrously tense matches, even if a few tactics – mortar spam, particularly – feel entirely too effective for their own good.

Despite its niggles and deficiencies, we do want to go back to this cold front again and again. *CoH2* takes its lessons from history literally. Like the Red Army it depicts, it wages its war by throwing everything forward, but like that Red Army, too many parts were left to die along the way. It can be a clumsy experience – a game with too many moving parts to feel coherent. Problems aside, the final result still feels like a winner.

Rich McCormick

- ✓ Increased soldier population, fantastic co-op and multiplayer.
- ✗ Wonky AI, micro-management made difficult through unintuitive controls and interface.

**8
10**



Remember Me

Don rose-tinted mirror shades for some recycled cyberpunk.

PC

@ www.remembermegame.com

\$ \$88

Set in a cyberpunk Paris where memory is currency, *Remember Me* is an action-adventure teenager desperate to impress you with its sheer weight of self-conscious stuff. On top of the usual jumping and running, it throws in stealth, rooftop chases, platforming and a few touches of its own.

But like a teenager, *Remember Me* is also a little awkward and prone to taking its cue from others. It's the oldest story in the dystopian book: amnesiac ex-badass finds herself inexplicably embroiled in a revolution, and being hunted by a menacing mega-corporation. But *Remember Me* succeeds when it's being familiar, a triumph that can be attributed to its spectacular looks and terrific musical score. France in 2084 is an absolute sight. Almost every location feels like it should have been part of a big-budget animation somewhere. Unfortunately, such cinematic moments are only possible because *Remember Me* is about as linear as it gets.

Both the best and worst part of the game is Memory Remixes, which ask you to change a vignette from a character's past to suit your goals. Your job here is to play film editor: wind and re-wind through the memory, watch for glitch-like openings and activate the right ones. But while the theory behind Remixes is borderline absolute genius, it's complete murder in practice. Learn to draw little circles with your cursor at exactly the right speed or you'll be doing it all bloody night.

Like the Remixes, the combat is less impressive than we'd hoped. The promise sounds grand: a robust combo system that lets you customise moves on demand, and a set of special moves (or S-Pressens as they are known) to provide utility and pizzazz. Unfortunately, you

can't actually fine-tune the combos themselves. What you can do is assign a Pressen to each move within a combo, thereby changing its effect and hopefully optimising the results, however, in the end you're still stuck with unsatisfying iterations of the kick-punch-kick mash. To the game's credit, it delivers on these promises to a degree. The combat is accessible; the Combo Lab, which is a neatly laid out menu split between available Pressens and your combo list, can be called up at any moment you desire, enabling you to adjust your attack combos to do such things as hurl bigger, harder punches, or regain health faster.

The stealth sequences are the best, although 'stealth' is a bit of a misnomer here. You'll mostly be in plain sight. Instead of evading human eyes, the game will call upon you to dodge the sensor radiuses of various security drones – a task that can involve trapping machines behind closed doors, inching behind potted plants, dodging into open doors and mindfully meandering around a corridor. These sections aren't particularly novel, but they are fun because they invite you to play along, rather than standing apart and showing off. Like a teenager, *Remember Me* is a touch too under-developed and self-indulgent to really love.

Cassandra Khaw

- ✓ A couple of new novel ideas...
- ✗ ...amongst a game packed with stuff we've seen too many times before.

6
10



ShootMania Storm

Pressing all the buttons of an old-school shooter.

PC

@ www.shootmania.com

\$ US\$19.99 via Steam

ShootMania was supposed to be the *TrackMania* of gun games: a simple shooter in what's become a tornado of killstreaks, unlocks and customisation. And it is, but only if you look at the bits where a mouse-click fires a gun at a bunny-hopping enemy. The rest is a rebuilding of the competitive FPS, but with an odd logic that suffuses everything from the menus to the movement.

It's clear we're in thrall to Nadeo's eccentricities even before a shot is fired. *ShootMania Storm*'s menu screen is full of tiles. The biggest one is *Storm*, but to the right there's a collection of smaller tiles with *Royal*, *Battle*, and *Joust* written on them, and to the far right there's *TrackMania Stadium*, an entirely different game. Er, which one of these makes people explode? We finally hop into a game of *Royal*, which we understand is the most basic game mode but even then it's not just your traditional deathmatch. It's fought in a massive arena: players are shoved out to the edges, equidistant from a central pole. That pole activates a storm that starts on the edge of the map and then contracts, forcing all the players closer and closer together. It's hilariously dramatic.

Matches begin like horse races, with everyone bolting out of their little cubby hole towards the goal. We stop and look around, because we've taken a few extra moments to orient ourselves, but everyone is fighting everyone else. It looks like a fairly simple game of precise shooting and dodging, but when we finally pluck up the courage to get involved, we're sluggish and off-pace. Others are demonstrably swifter. Then we notice the Stamina bar and it all makes sense: jump and a little bit of stamina drains; spam the spacebar (or right-mouse button) and it'll drop swiftly. It keeps bunny-hopping in check, but the Stamina bar is also tied to sprint. In order to sprint, you first need to jump, take your finger off the jump button, then hit it once again just before you land and you'll run for a short time, but cover a lot of ground. It also has a third use, which we discovered when we ran towards the top of a hill and fell into a huge hole. As we fall we hit the spacebar. For a few moments we glide.

Movement isn't the only action that's tied to an energy system. Shooting is, too. It's not as complicated, but you do need to take care not to spam away the weapon's charge (usually four shots per charge).

There were moments where all the movement mangling clicked: we'd dodge plasma blasts while riding this strange gust of wind the control system seems to invoke. It feels like it was built for speedruns and frag

videos, made for people with preternatural skill who can keep up with the zippy turns and can lead their target perfectly. You feel swift, deadly and accurate. You take shots on instinct and watch players fall away as you sweep on. There are molecules of wall-jumping and rocket-jumping deep within *ShootMania*'s DNA, and they've been teased out in the *Obstacle* maps. They're not official and you don't fight – instead you attempt to defeat a series of increasingly difficult physical challenges, a string of awkward jumps that need a keen understanding of the movement rules.

Because it's a game with an easy editor that rests on the creativity of its community, levels can vary wildly in quality and size. The symmetrical design of *Royal* means there's not a lot of balance issues to fret over, which is quite refreshing in an FPS. It frees the modders to think about how to best build for leapy, speedy, agile players. Most *Royal* arenas are huge, with everyone launched into the air at the start. Nadeo are at least trying things. Another favourite of the community, *Elite Mode*, has one attacker playing against three defenders, and is remarkably satisfying to win. It's balanced by the selection of weapons, with the attacker getting the railgun and the defenders struggling with the rocket launcher. Combo is even more bizarre, an experimental mode full of collectible drops. The most important part is that you need to kill both members of the opposing team within a time limit, so when the first dies the second must be killed within a few seconds or the match continues. It's cool, but there are barely any servers playing it, which is part of the main problem Nadeo are facing. They're trying to evolve a game and genre but the community is small. They're working with a niche, so whatever they make won't make a big difference to the wider FPS world. Making a game that's initially baffling doesn't help when you're attempting to entice a new set of players, either. It's good, but it's basically built to emulate what it's like to be a pro-*Quake* player, and in doing so it misses the point of the games it's attempting to remake. They were simple, and *ShootMania* simply isn't.

Craig Pearson

- ✓ A good shooter...
- ✗ ...buried under a baffling UI, confusing rulesets and a movement scheme that's needlessly complex.

7
10



GRID 2

Moves fast and handles like a dream, but won't stop checking its Twitter feed.

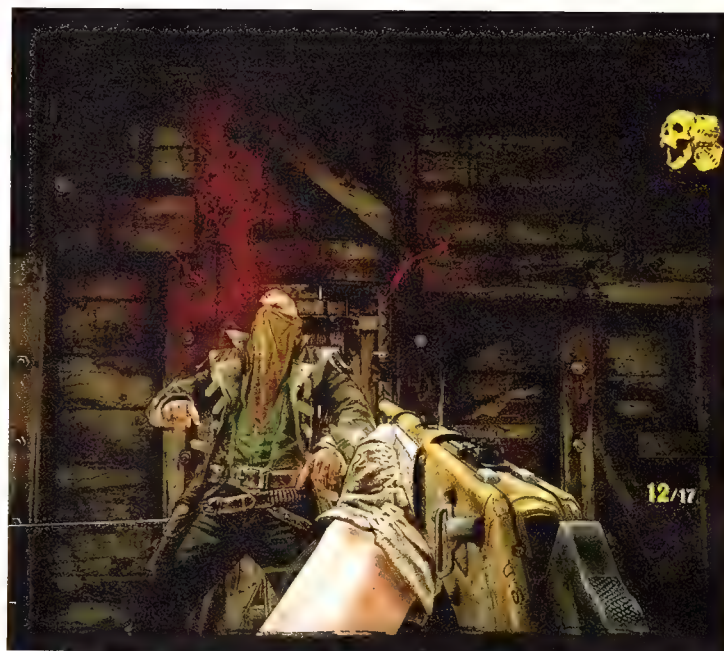
PC

@ www.gridgame.com

\$ \$79

There's a long corner arching through a part of *GRID 2*'s sun-drenched Californian track where a squirrel dashes across the road. It's always at precisely the same point, and always just as your car lurches into the basin of a gentle drop and rise. And, despite racing that stretch of road 30 or perhaps even 40 times, we still haven't been able to hit it. Symbolically, what this does is it speaks to *GRID 2*'s wonderful presentation; glistening and iridescent and other things your car would be if it was really clean. But it also embodies *GRID 2*'s biggest problem; that for all its top-class visuals and excellent handling, somehow the game doesn't seem to believe that just racing is interesting enough concept on its own. That's why the Career Mode, in the laboured style of older *TOCA* titles, is propped up clumsily with a threadbare story, complete with brick-subtle style combination of American-accented enthusiasm and awkward social media buzz-wording; with fans collected like a currency as your driver rises to global prominence. Put the squirrel aside though, and *GRID 2* is chock-full of good things. Central among them is the superb handling, which from the first few cars earned in your modest garage to the driveable fortunes won after a few successful seasons is punchy, weighty and growling. It's sophisticated enough to require an adjustment to the precise balance and purchase of each new vehicle, and to enable you to 'feel' rather than simply see when you slide across different surfaces. There's decent variety to the grab-bag of events too, mixing up point-to-point races with closed road and track competitions and a handful of other one-off promo events. What really keeps the experience fresh, though, is the admirably aggressive AI, which, while somewhat robotic in its drive-line, will still happily shunt and nudge you cliff-wards if the opportunity arises.

Nathan Ditum



Call of Juarez: Gunslinger

Partial recall — how the West was fun.

PC

@ www.callofjuarezgame.com

\$ US\$17.95 via Steam

Silas Greaves is probably full of shit, but that's okay. He's a bounty hunter with a million stories to tell and happy to share them over a whisky. Like the times he rode with Billy the Kid, or when he won the praise of 'Injun' magic men, or that shootout he had with Butch Cassidy and the Sundance Kid (simultaneously). The trouble is, nobody can quite remember seeing him there. This isn't just a framing device for *Gunslinger*'s nine missions, but a big part of what helps this downloadable budget title wash away the foul taste of *Call of Juarez: The Cartel*. Set in a romanticised version of the Wild West (which the game itself at one point admits is complete balls), *Gunslinger* is a mash of tales roughed-in from the clouded perspective of Greaves, with a little audience comment on throughout; the result is routinely changing narration and game-world to fit the story on the fly. At one point, for instance, you fight through a mine packed full of dynamite that only an idiot would go into with guns blazing. "That's why I didn't," rasps Greaves, as the action rewinds in order to tell the story 'properly'. This doesn't disguise the game's arrow linearity, but it does make the straight path much more interesting. Restricting *Juarez* to raw gunplay certainly doesn't hurt it though, because the shooting is excellent. Although it doesn't rewrite the rules of the FPS genre, there's a real weight to the weapons while the action is a mix of regular shootouts and a special slow-mo Concentration mode used to take out larger groups in the blink of an eye. This ability – thankfully – regenerates quickly and provides an interesting power balance, where you can't take too much damage, but regularly get to go full Angel of Death against overwhelming odds. Combined, the two parts work beautifully. The story keeps things slightly off-balance and constantly throws up interesting moments, while the minute-by-minute gunplay makes murdering your way through that story intensely satisfying. A real surprise and definite must-play.

Richard Cobbett

- ✓ An accomplished and visually strong racing title...
- ✗ ...that's only let down by a bafflingly lame Career Mode narrative.

8
10

- ✓ Packed with quality tongue-in-cheek shooter action for the money.
- ✗ Would have loved it to be longer.

9
10

THE WORLD'S FLAT AFTER ALL

It's possible that after endless years of drawing gushing acclaim for his always slick-looking Apple products, Sir Jony Ive, the company's esteemed design guru, may have jumped the shark. The reaction to the first public images of the new streamlined, brightly coloured and gradient-drenched iOS 7 UI overhaul have been met with mixed reception. While some champion the updating of the old 'skeuomorphic' hallmarks, many are mocking the overly fluoro palette and simplistic elements of the new 'flat design' scheme. The inevitable Tumblr, Jony Ive Redesigns Things (jonyiveredesignsthings.tumblr.com), imagines what some other famous things might look like if Sir Jony had his way with them...



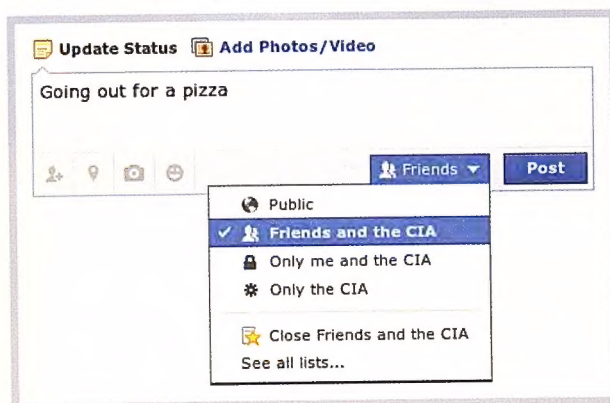
OVER & OUT



It seems like every day there's a new instant messaging protocol turning up on the block (hello Google Hangouts!), but it's not every day that a messaging system, especially a hugely significant one, takes its leave. Alas, it's with sad, geeky reverence that we inform you that just before this issue hit the newsstands, the last ever telegram was sent. On July 14, BSNL, India's state-owned telco, shut down the country's still-running telegram network for financial reasons. Amazingly, the telegram was still in wide use throughout India, which only enjoys 26% mobile penetration.

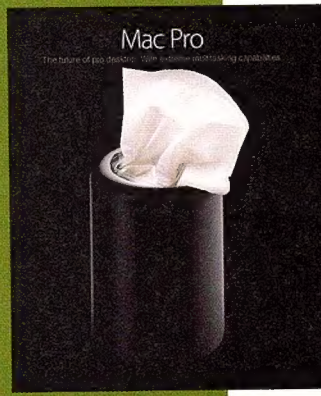
SHARE & SHARE ALIKE

The whole PRISM surveillance wrangle highlights a number of important issues, but perhaps the most obvious is just how potentially exposed all our web and social media communications really are. Anything you upload or send privately online can effectively be accessed, whether via hackers breaking into your account or by government agents pursuing you legally (or illegally), obliging your service provider – be it Apple, Microsoft, Google or Yahoo! and so on – to promptly hand over the keys to your digital activity. It's no laughing matter, but even so, it's nice to see the webizens of the world have a sense of humour over the whole affair, with this charming Facebook 'privacy options' meme currently doing the rounds.



PRO VERSATILE

The new Mac Pro desktop, unveiled at Apple's 2013 WWDC developer conference and on sale later this year, is certainly a distinctive-looking beast. But just how distinct? No sooner had the slimmed-down tubular chassis been shown onstage to the gasps of an adoring crowd than a wave of amusing Photoshopped lookalikes popped up online, creatively highlighting how similar the sexy black Mac is to... a tissue box. Among other things. **apc**



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